Future Water Supply Study

Technical Appendices B-F

Final Report

August 1996

Contra Costa
Water District

C—100244

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CONTRA COSTA WATER DISTRICT

PLANNING DEPARTMENT

FUTURE WATER SUPPLY STUDY

FINAL REPORT
TECHNICAL APPENDICES B -F

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C-100246

TECHNICAL APPENDICES

TA-A Demand

TA-B Screening Criteria
TA-C Conservation Components
TA-D Supply Components Defined
TA-E Environmental Considerations of Transfer Pathways
TA-F Economic Analysis

TA-G Public Involvement 1
TA-H Public Involvement 2

C-100247

Table of Contents

TECHNICAL APPENDIX B: SCREENING CRITERIA

TECHNICAL APPENDIX C: CONSERVATION COMPONENTS

TECHNICAL APPENDIX D: SUPPLY COMPONENTS DEFINED

TECHNICAL APPENDIX E: ENVIRONMENTAL CONSIDERATIONS OF TRANSFER PATHWAYS

TECHNICAL APPENDIX F: ECONOMIC ANALYSIS

LIST OF EXHIBITS

LIST OF EXHIBITS

Technical Appendix B: Evaluation Criteria

SUMMARY

"The Mission of the Contra Costa Water District is to strategically provide a reliable supply of high quality water at the lowest cost possible in an environmentally responsible manner." To help meet the Mission, the District has identified a series of goals. A number of these goals have been developed into criteria that were used in the Future Water Supply Study. The District goals forming the basis for the criteria include:

Operational goals:

- Operate/maintain District facilities in a safe and cost effective manner.
- Plan, design and construct facilities consistent with District needs.
- Ensure high quality water for current and future needs.

Economic goals:

- Effectively manage the District's financial resources.

Environmental and Implementability goals:

- Ensure that all District activities meet or surpass all applicable laws and regulations.

The evaluation criteria contained in Technical Appendix B represent the spectrum of factors that were evaluated for each Future Water Supply Study Resource Alternative. These criteria were used to rate Resource Alternatives relative to each other. The evaluation criteria are presented in the following four categories:

- Operational
- Economic
- Environmental
- Implementability

The criteria were provided for District review, initially at the July 1994 workshop. In response to the November 1994 Board Workshop, the criteria were refined through a simplification of wording and reduction in total criteria used. There are now 3 criteria listed under each of the four categories, for a total of 12. The list of refined criteria presented at the April 1995 workshop used to evaluate Resource Alternatives is provided on the following page.

Each new criterion is presented in a separate section. Each section states the criterion, identifies the factors used to evaluate the Resource Alternatives, and provides guidance for how a Resource Alternative is rated as either High, Medium or Low.

EVALUATION CRITERIA (FINAL)

O1* **Minimize** water **shortages** (frequency and amount)

O2* Maximize water **system reliability**

O3 Maximize the **quality and treatability** of source waters

Ec1* Minimize **life-cycle costs**

Ec2* Minimize **rate impacts** to customers

Ec3 Minimize **indirect economic impacts** to customers

En1 Minimize environmental impacts to **aquatic habitat** (including threatened and endangered species)
- upstream
- in the Delta
- at the point of diversion

En2 Minimize environmental impacts to **special status terrestrial species and wetland resources**

En3 Minimize impacts to **the community**

I1 Maximize the **seniority of water rights**

I2 Minimize **institutional barriers** and risk of delay

-2 I3* Ensure proper **timing and phasing**

Notes: **Bolding** represents key words or phrases by which each criterion may be referred to in future charts, etc., as the study progresses into the screening and evaluation process. * indicates key criteria advanced to Round 2 screening.

OPERATIONAL EVALUATION CRITERION 01:
Minimize Water Shortages (Frequency and Amount)

Evaluation Factors:

- Annual availability of water by water year type (acre-feet)
- Season of availability (summer or winter)
- Difference between availability and demand, as a percent of total demand

Rating:

High	Supplies would be available to meet demand in most years, especially in drier years and in the summer; low magnitude and frequency of shortages
Medium	Supplies would be available to meet demand in most years, but could be limited in drier years and/or in the summer; moderate magnitude and frequency of shortages
Low	Supplies would be limited, even in wet years or in the winter; high magnitude and frequency of shortages

OPERATIONAL EVALUATION CRITERION 02:
Maximize Water System Reliability

Evaluation Factors:

- Likelihood of disruption of the supply from seismic events and/or floods
- Capability to meet CCWD Seismic Design and Reliability Criteria
- Likelihood of disruption to service from technical causes
- Complexity and number of technical systems (including treatment and transmission facilities) that could fail or require significant levels of maintenance

Rating:

High	Technology has been tested, proven and accepted as the standard; high confidence-level of the systems' operational capabilities; high confidence in site stability
Medium	Technology has been tested but has limited field experience; medium confidence-level in the systems' operational capabilities; medium confidence in site stability
Low	Technology is new, unproven and has very limited field experience; low confidence-level in the systems' operational capabilities; low confidence in site stability

C-100256

OPERATIONAL EVALUATION CRITERION 03:
Maximize the Quality and Treatability of Source Water

Evaluation Factors:

- Ability of potable water to meet existing drinking water standards
  - With existing treatment facilities
  - With planned treatment facilities
- Ability of potable water to meet currently anticipated drinking water standards
  - with existing treatment facilities
  - with planned treatment facilities
- CCWD Source Water Quality Objectives
  - Chlorides
  - Sodium
  - Pathogens
  - Disinfection Requirements
  - Turbidity
  - Contaminants
  - Organic Carbon
  - Alkalinity
- CCWD Treated Water Quality Objectives
  - Disinfection by-products
  - Taste and odor
  - Turbidity
  - Corrosiveness
- Non-potable water to be of a quality appropriate to its use

-4

- Range in fluctuations in raw and treated water quality
- Level of treatment required

Rating:

High A consistently high quality source of water which can meet all existing or currently anticipated drinking water standards with existing or planned treatment facilities. Treated potable water quality is consistent with CCWD Treated Water Quality Criteria and may improve existing quality of water through blending. Non-potable water of consistent quality appropriate to its use

Medium A moderate quality source of water. Raw water can be treated to meet all existing and currently anticipated drinking water standards at existing or planned facilities. Treated potable water quality is comparable to existing treated water quality and does not enhance or degrade existing water quality. Quality fluctuates over a moderate range

Low Raw water requires additional or specialized treatment to meet existing and currently anticipated drinking water standards. The potable source water does not meet CCWD Water Quality Criteria and, therefore, degrades existing water quality. Quality fluctuates

ECONOMIC EVALUATION CRITERION Ec1: Minimize Life-Cycle Costs

Evaluation Factors:

- Contract costs
- Capital costs of new/expanded modified facilities
  - Storage facilities
  - Treatment facilities
  - Conveyance facilities
  - Distribution facilities
- Mitigation costs
- Project life expectancy
- Permitting and environmental compliance costs
- Annual operation and maintenance costs of required programs
  - Energy costs
  - Chemical costs (treatment)
  - Disposal costs (sludge, brine, etc.)
  - Labor costs
  - Replacement costs
  - Conservation costs (water saving technology)
  - Other costs

Rating:

High	Low life-cycle costs
Medium	Moderate life-cycle costs
Low	High life-cycle costs

ECONOMIC EVALUATION CRITERION Ec2: Minimize Rate Impacts to Customers

Evaluation Factors:

- Magnitude of rate impacts
- Distribution of rate impacts
  - Customer classification (e.g., residential vs. industrial)
  - Existing vs. future customers

Rating:

High	Low rate impacts
Medium	Moderate rate impacts
Low	High rate impacts

C-100258

ECONOMIC EVALUATION CRITERION Ec3:
Minimize Indirect Economic Impacts to Customers

Evaluation Factors:

- Number of jobs gained or lost in the local/regional economy
- Contribution to diversification of economic sectors
- Direct/indirect economic impacts to businesses and employment

Rating:

High	Beneficial indirect economic impacts on customers
Medium	No noticeable indirect economic effects on customers
Low	Indirect negative economic impacts on customers, such as overall job losses in the local and regional economy, decrease in the diversity of economic sectors, and decrease in the health of economic sectors including agriculture

ENVIRONMENTAL EVALUATION CRITERION En1:
Minimize Environmental Impacts to Aquatic Habitat (including Threatened and Endangered Species)
- upstream
- in the Delta
- at the point of diversion

Evaluation Factors:

- Flows in the Lower Sacramento and San Joaquin Rivers and Delta channels during critical periods
- Habitat conditions (spawning areas, vegetation, pollution, etc.)
- Location of the entrapment zone (point at which fresh and salt water meet)
- Diversions of Sacramento River water into central and south Delta, and volume of Delta diversions when sensitive fish species or life stages are present:
  - Delta smelt juveniles (spring)
  - Striped bass juveniles (spring)
  - Chinook salmon juveniles (spring)
  - Chinook salmon adults (spring, fall)
- Use of fish screening technology at Delta pumps
- Volume of Delta diversions during low flow conditions
- Reservoir end-of-year storage
- In-river temperature conditions
- Instream flow conditions for aquatic resources in project controlled streams

Rating:

High	Enhances aquatic habitat conditions
Medium	Maintains present aquatic habitat conditions
Low	Degrades aquatic habitat conditions

ENVIRONMENTAL EVALUATION CRITERION En2: Minimize Environmental Impacts to Special Status Terrestrial Species and Wetland Resources

Evaluation Factors:

- Natural communities of regional significance:
  - Contra Costa County General Plan Significant Ecological Resource Areas (SERAs)
  - Dept. of Fish and Game Natural Community Elements (DFG elements)
  - Other valuable wetland, riparian or upland communities (native grasslands, vernal pools, seasonal marshes, willow-cottonwood forests, and oak riparian forests)
- Degree of fragmentation and/or reduction in habitat size
- Potential changes (positive or negative) in ecosystem functionality
- Number and type of natural communities potentially impacted
- Primary special status species (i.e., Federal or State listed Endangered, Threatened, Federal-Proposed or State-Candidate)
- Secondary special status species (all other listing categories as encompassed by CEQA)
- Extent of impact to individual populations and known habitat areas for a special status species
- Extent of impact to total known habitat area for a special status species
- Extent of potential habitat improvement or degradation that may occur for a special status species
- Total number of special status species that may be impacted
- Extent to which an adverse impact can be mitigated

Rating:

High	No natural communities of regional significance or other valuable communities will be adversely impacted
Medium	Adverse impacts will occur but these impacts can be mitigated
Low	Adverse impacts will occur but these impacts cannot be mitigated

ENVIRONMENTAL EVALUATION CRITERION En3: Minimize Impacts to the Community

Evaluation Factors:

- Impacts on existing patterns of land use
- Impacts on availability or quality of public recreation resources
- Direct/indirect effects on public services
- Impacts on public health and safety from project operations, including waste products
- Societal costs of energy use for project construction and operations
- Effects on lifestyles of the public
- Direct/indirect effects on agricultural enterprises

Rating:

High	Beneficial impacts to sociocultural resources
Medium	No noticeable effect on sociocultural resources
Low	Negative impacts on sociocultural resources, such as the social impacts of taking agricultural lands out of production, relocation of homes/communities, loss or diminishment of recreational resources, decrease in the quantity and/or quality of public services such as fire protection, potential public hazards from project operations including waste products, energy expended, or induced negative changes in water use practices or patterns

-8

IMPLEMENTABILITY EVALUATION CRITERION I1: Maximize the Seniority of Water Rights

Evaluation Factors:

- Existing water right vs. new water right application
- Type of water right
  - Pre-1914 appropriative (preferable)
  - Post-1914 appropriative
  - Riparian
- In-basin vs. out-of-basin water transfer
- Groundwater
  - Local
  - Remote (management district)
  - Remote (no management district)
- Institutional restrictions which affect the District's ability to take water under its water rights (e.g., pumping restrictions, flow requirements, salinity levels)

Rating:

High	Relies on existing water right(s) with pre-1914 appropriative right or is local groundwater supply
Medium	Relies on existing post-1914 appropriative water right(s) or remote groundwater supply in area with management district
Low	Relies on riparian water right, requires new water right(s) or relies on groundwater supply from remote, unadjudicated groundwater basin

IMPLEMENTABILITY EVALUATION CRITERION I2: Minimize Institutional Barriers and Risk of Delay

Evaluation Factors:

- Number of other entities and history of relationship
- Number of regulatory agencies with jurisdiction
- Numbers of existing contracts/permits requiring modification
- Facility priority of use
- CCWD existing plans and policies
- State plans and policies (e.g., Area of Origin and Basin Water Quality Plans)
- Likelihood of legal challenge and delay, including water rights protests
- Complexity of permitting issues (e.g., 404 wetland permits), approvals required
- Capability to meet CCWD Seismic Design and Reliability Criteria
- Complexity and number of technical systems (including treatment and transmission facilities) that could fail or require significant levels of maintenance
- Mitigation requirements
- Relocation of individuals/communities
- Ability to be funded
- Ability to sell or transfer water and recover funds if growth is less than expected
- Degree of uncertainty that could affect costs including changes in projected growth, Federal and State regulatory processes, seismic events, and potential future restrictions on Delta conveyance and diversions

Rating:

High	Minimal likelihood of delay
Medium	Some risk of delay
Low	High likelihood of delay

IMPLEMENTABILITY EVALUATION CRITERION I3: Ensure Proper Timing and Phasing

Evaluation Factors:

- Approximate time needed for environmental documentation
- Approximate time needed for engineering design
- Approximate time needed for environmental compliance
- Approximate time needed for construction
- Integration with existing and planned facilities
- Ability to meet different types and levels of demand (e.g., peak and seasonal demand)
- Ability to respond to planned and/or unplanned changes in demand
- Redundancy with existing facilities

Rating:

High	High certainty that water will be available when needed
Medium	Reasonable certainty that water will be available when needed
Low	Little certainty that water will be available when needed

Technical Appendix C: Conservation

SUMMARY

This document summarizes the development of the FWSS Demand Management Analysis (DMA). The purpose of the DMA was to reduce projected demand and thereby meet, or lessen, the need for additional water supplies. While it was concluded that demand management alone can not meet the entire need for additional water, it has a large role to play in the solution. The DMA included three key elements: long-term conservation programs, short-term drought reductions, and demand hardening. Three Conservation Program Alternatives (CPA) were developed along with a 15% Drought Management Program (DMP). This document presents the savings and cost estimates for the three CPAs; describes the DMP, including identifying required reduction goals by customer category; and examines the relationship between the long-term CPAs and a short-term DMP. All the information presented in this document is for Service Area C. Two attachments at the end of this Appendix provide further detail.

MAJOR ASSUMPTIONS AND DEFINITIONS

This section presents major assumptions, definitions, and issues relevant to the DMA. **Measures** are individual conservation practices such as audits or rebate programs. Assumptions for each of the measures were developed from many sources, including past District reports and data and discussions with staff from CCWD's Conservation Office. Information regarding the measures, and the measures themselves, should be periodically revised and updated to reflect the most current knowledge.

CPAs are combinations of measures which achieve a stated level of demand reduction. Cost and savings estimates have been based on specific measures discussed later in this document. As the measures are implemented over the next 45 years however, they may differ in design and coverage from those described. The District's conservation program should be flexible to respond to changing markets and technology. Also, some measures may prove to be more successful than others. Funding should be allocated to maximize water savings, while ensuring conservation assistance is offered to all customer categories. Monitoring and evaluation of conservation savings and customer demand should be an ongoing process in the analysis.

Market Potential and Coverage refer respectively to the total number of households and accounts that *could* be affected by a measure and the number of households or accounts that are affected by a measure. **Retention** refers to the number of households or accounts that accept and retain a conservation measure. Demand reduction or conservation savings is the product of coverage, retention, and percent savings for each individual measure. Conservation savings estimates assume a uniform savings rate over the 45-year projection period. It is likely that savings will actually fluctuate over the period, particularly in the early years when demand is rebounding from the recent drought. However, it is impossible to identify these fluctuations.

No Action Demand refers to CCWD's future demand should no additional conservation efforts be undertaken by the District or its wholesale retailers. The No Action demand projections presented in Technical Appendix A do include an estimate of "No Action" conservation savings. These savings, ranging between 6 and 10 percent, result from State and Federal regulations and the normal replacement of fixtures and devices with more water efficient models. The additional conservation and drought management savings are based on the population, account, and consumption estimates developed in Technical Appendix A. Exhibits C-1 and C-2 present the demand and account information used to calculate these additional savings.

Exhibit C-1
No Action Demand (Acre-feet)

	2000	2020	2040
Single Family	51,908	61,635	62,933
Multi Family	17,303	20,545	20,978
Commercial & Light Industrial	23,292	33,708	36,126
Large Turf	15,528	22,472	24,084
Industrial	48,520	48,520	48,520
Total	**156,550**	**186,880**	**192,640**

* Does not include unaccounted for water.

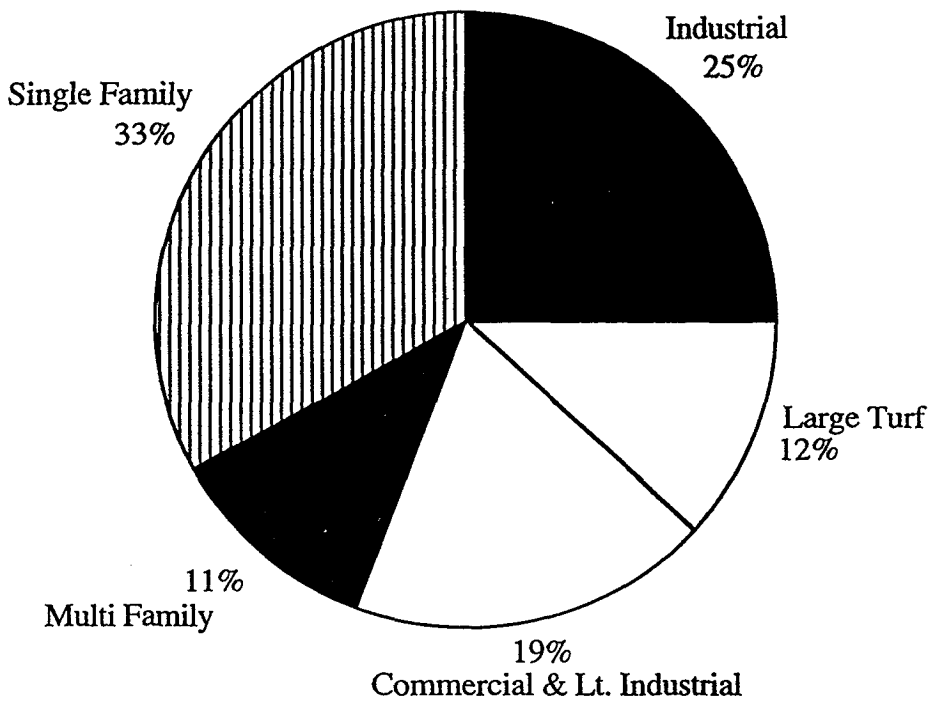
Exhibit C-2
Households and Accounts*

	2000	2020	2040
Single Family	113,902	143,103	156,114
Multi Family	47,872	60,145	65,613
Commercial & Light Industrial	23,292	33,708	36,126
Large Turf	15,528	22,472	24,084

* Note the projected number of Industrial accounts was not developed as part of this analysis.

CCWD's demand is comprised of five distinct **Customer Categories:** Single Family, Multi Family, Commercial & Light Industrial, Large Turf, and Industrial. Exhibit C-3 identifies the distribution of 2040 No Action demand by customer category. Water use by Single Family, Multi Family, and Large Turf customers is fairly uniform within the customer category. Industrial and Commercial customers' water use varies significantly by account. Individual measures were developed to provide conservation assistance to each of these customer categories.

Exhibit C-3
Distribution of 2040 No Action Demand



C-3

LONG-TERM CONSERVATION SAVINGS

Three CPAs were developed which result in a range of conservation savings between 5 - 12% in the year 2040. Exhibit C-4 depicts the overall savings expected from each of the CPAs. All of the CPAs include the following measures which were culled from the District's current conservation efforts, BMPs currently in effect, and measures proposed in CVPIA and California Urban Water Conservation agreements: Public Information and Education; System Operations and Loss Reductions; Pricing and Incentives; Plan Reviews and Ordinances; Model Landscape Guidelines and Water Waste Prohibitions; Audits; and ULF Toilet Rebate Program. The individual measures are discussed in detail below.

Exhibit C-4
Additional District-Wide 2040 Reductions (beyond No Action)

CPA 1	5%
CPA 2	9%
CPA 3	12%

System Operations and Loss Reductions

This program includes monitoring, inspection, evaluation, and rehabilitation of the District's Treated and Raw Water Distribution and Storage Facilities to maintain system water losses and unaccounted-for-water (UAW) at their present low levels. Specific efforts include maintaining meter accuracy, canal lining rehabilitation, monitoring pumping efficiencies, leak detection and repair. It also includes monitoring and reduction of water pressure where appropri-

ate. Over the past 20 years, the District's treated water system losses have averaged about 7% of the total water produced. The FWSS demand projections assume a UAW of 6 to 8 percent for areas within the Treated and Raw Water Service Areas.

Public Information and Education

A strong Public Information and Education program will be the key to successful implementation of the CPAs. These efforts will be designed to support the specific measures included in each CPA. General activities which will be included in any Public Information/Education effort are direct customer contacts; preparation and distribution of conservation publications; purchase and distribution of conservation reminders; and participation on local, state, and national conservation committees. To avoid double counting, water savings have not been attributed to this measure since Public Information and Education efforts tend to improve the market coverage and retention efforts of the other conservation practices.

Pricing and Incentives

CCWD's water rates provide customers with an economic incentive to keep water use low. The savings associated with the existing pricing program have already been factored into the FWSS demand projections. Therefore, no reductions will be attributed to the existing pricing structure. Over the future study period, the District may continue to evaluate alternative rate structures and, if changes are made, will determine whether additional savings should be attributed to this measure.

Plan Reviews

This program targets new residential and non-residential water customers to encourage installation of water efficient plumbing fixtures and irrigation systems at the time of construction. Plan reviews are currently conducted by local building or planning departments, so the effectiveness of this program is outside of the District's control. Future programs will strive to include more District participation in the process. The District currently has little control over this effort and since most of the savings would come from exterior water uses, there is potential overlap between this measure and model landscape guidelines, therefore, savings have been shown under model landscape guidelines only. This assumption should be re-evaluated as part of the conservation monitoring program.

Model Landscape Guidelines and Water Waste Prohibitions

The effectiveness of a model landscape guideline and water waste prohibitions is dependent on education and enforcement. Consequently, the District's audit staff will also be charged with administering these programs. The model landscape guideline would apply to new construction only. Under CPA 1, the District will continue to work with its wholesale customers and the cities within its service area to ensure that water efficient plants and irrigation equipment are installed in new construction. Residential savings, for new customers through the year 2020, are estimated at 10% and then they increase to 15% from 2020 through 2040. Under CPA 3, the District would have to undertake a much more aggressive program with stricter enforcement procedures and new residential customers would have to undertake more drastic modifications to ensure a 15% savings through the year 2000, increasing to a 20% savings through the year 2020, and finally jumping to 25% savings through the year 2040.

Devices, Toilets, and Appliances

The primary focus of this measure would be the Ultra-low-flow Toilet (ULFT) Rebate Program. The rebate amount would be $75 to $100. This measure would be discontinued in the year 2020, since the market will be saturated with ULFT's by then. The measure would be available to both residential and non-residential customers and would be similar to the District's current program. The CPAs would differ by the replacement rate and the rebate amount, with CPA 1 being the least aggressive and CPA 3 being the most aggressive.

Under CPA 1, a $75 rebate would be offered to 4,000 residential and 600 commercial customers. CPA 2 would offer a $75 rebate to 4,500 residential and 675 commercial customers. Under CPA 3 the rebate amount increases to $100 and rebates would be available to 4,500 residential and 675 commercial customers.

Audits

Audit Programs would target all residential and non-residential customer categories and would include review of indoor and outdoor water uses. The audits will include distribution and installation of interior plumbing devices and fixtures; leak detection; review of the irrigation systems performance; preparation of personalized irrigation schedules; distribution of educational information; and follow-up. It is assumed that the audits will be repeated every 10 years. CPA 1 would be very similar to the District's existing audit programs. However, the District would more aggressively solicit audits and would consequently conduct more audits than under the current program. Under CPA 3, not only would the District more aggressively pursue and follow up audits, but customers would have to make more drastic modifications to their water use practices and equipment as a result of the audits. In the year 2040, residential coverage under CPA 1 would be approximately 22% and under CPA 3 it would be almost 67%. Residential savings per audit under each program in the year 2040 would be 20%. However, under CPA 1 retention would be 40%, while under CPA 3 it would be 60%. This dramatic increase would be the result of an overall more aggressive approach to conservation under CPA 3 which could include strict enforcement, penalties, and price increases.

Generally, the individual CPAs differ by the relative savings achieved, voluntary versus mandatory controls, relative costs, reliability, technical feasibility, and ease of implementation. The level of effort expended by the District and its customers increases as one moves from CPA 1 to CPA 3. Conversely, the reliability and ease of implementation decreases as one moves from CPA 1 to CPA 3. CPA 1 is an expansion of the District's current conservation efforts to encompass CCWD's wholesale and retail customers and is consistent with currently mandated Best Management Practices. CPA 2 is similar to CPA 1, but with higher coverage and participation levels. It requires considerable effort from CCWD and its customers, but is an achievable program. CPA 3 represents the most aggressive conservation program with very high coverage and participation levels. It places a large burden on CCWD's customers and is considered the least reliable due to the high coverage and retention requirements and reductions imposed during future droughts. Attachment 1 to this Appendix includes exhibits which identify the coverage, retention, and savings estimates for each measure and each CPA.

C-5

In order to achieve the District-wide conservation reductions identified in Exhibit C-4, different percent savings are required by each of the five customer categories. The largest percent reductions are expected from Single Family and Large Turf customers. CCWD's Conservation Office identified the largest potential for savings from outdoor water uses since these customer categories use more water outdoors than the others. Industrial customers' water use is strongly linked with their economic viability. This customer category has already significantly reduced their water use and therefore have the least potential for further demand reduction. Consequently, the lowest percentage reductions are expected from Industrial customers. Exhibit C-5 identifies the 2040 percentage savings goals by customer category for each of the CPAs.

Exhibit C-5
2040 Savings Goals by Customer Category

Customer Category	CPA 1	CPA 2	CPA 3
Single Family	6%	10%	14%
Multi Family	5%	9%	13%
Commercial & Light Industrial	5%	9%	13%
Large Turf	7%	12%	18%
Industrial	2.5%	4%	6%
District-Wide Reduction	5%	9%	12%

Long-term Conservation Program Costs

Exhibit C-6 identifies the annual cost for each of the CPA's in the years 2000, 2020, and 2040. These costs reflect only the District expenditures and do not include customers' costs. All costs are in 1996 dollars and have not been escalated, discounted, or financed. The costs are at a level of accuracy consistent with the District's Capital Improvement Program estimates and are appropriate for planning-level studies only. Costs are for the long-term conservation programs only and do not include costs related to drought management programs.

As expected, the highest costs are associated with the most aggressive program, CPA 3. Most of the costs (75%), are related to the ULFT Rebate and Audit Programs. Coverage for the Audit Programs under each CPA continues to increase through the year 2040 to ensure BMP and savings requirements are met. Consequently, each CPAs' costs increase as well. Year 2040 costs are lower than year 2020 costs because the ULFT Rebate Program ends in the year 2020. Exhibit C-7 summarizes the full-time-equivalent (FTE) staffing required to implement each of the CPAs in the years 2000, 2020, and 2040. Staffing will include both permanent and temporary positions. Attachment 2 to this Appendix provides a detailed overview of cost and staffing estimates.

Exhibit C-6
Annual Costs for each CPA
(Millions of 1996 Dollars)

	2000	2020	2040
CPA 1	$1.4	$1.6	$1.2
CPA 2	$1.8	$2.1	$1.7
CPA 3	$2.8	$3.3	$2.8

-6

Exhibit C-7
FTE Staffing for each CPA

	2000	2020	2040
CPA 1	12.3	15.7	15.6
CPA 2	16.7	21.4	21.7
CPA 3	27.4	35.0	36.8

SHORT-TERM DROUGHT REDUCTIONS

Short-term drought responses are distinguished from long-term conservation by their temporary nature. Conservation yields sustainable savings, while drought response yields drastic, interim cutbacks. Typical drought responses include habit changes such as shorter showers, fewer flushes, and less outdoor watering.

Since exterior water uses are typically considered more discretionary, customer categories with more outdoor water use, Single Family Residential and Large Turf, will be asked for the largest cutbacks in future droughts. Industrial customers will be asked for the smallest drought reductions because they are already efficient water users and in many cases, the only way to further reduce use is to decrease production. The potential economic impacts on these customers and the general community do not justify imposing larger drought restrictions. Another challenge facing some Industrial customers during drought is that their demand for water from CCWD actually increases, since poor water quality renders their supplemental supplies useless.

CCWD chose to include an overall 15% Drought Management Program (DMP) during future water shortage emergencies as an element of its planning analysis in order to contrast with the impacts of meeting the shortfall with supply augmentation strategies such as spot market purchases. In order to achieve the District-wide reduction, different percentage reductions must be achieved by each of the five customer categories. Exhibit C-8 identifies the year 2040 drought reductions goals by customer category (for the TWSA customer) that together will yield an overall 15% drought reduction in future use. Future DMPs would be similar to the effort expended during the 1991 - 92 drought and consistent with CCWD's current emergency water reduction plan found in the Shortage Contingency Section of the 1995 Urban Water Management Plan. To achieve the goals for a Stage II reduction (Water Alert), future DMPs would include series of staged actions consisting of a rigorous public information campaign, water allotment billing, and drought emergency regulations.

Exhibit C-8
Year 2040 - 15% Drought Management Program Goals by Customer Category for the Treated Water Service Area

Single Family	25%
Multi Family	20%
Commercial & Light Industrial	10%
Large Turf	25%
Industrial	2.5%

Demand Hardening

CCWD's customers have responded well to previous droughts, exceeding their overall reduction goals. During the 1991 - 92 drought, CCWD's treated water customers were asked to reduce use by as much as 26%. In response, some of CCWD's Industrial and Commercial customers installed new equipment and devices, repaired leaks, and modified processes to achieve their water reduction goals. Many residents installed water saving devices in toilet tanks and showers. These permanent, structural changes resulted in long-term conservation savings and increased the efficiency of water use in the District. As the efficiency of water use continues to increase through long-term conservation efforts, drought reduction goals will become more difficult to achieve and sustain. Higher conservation levels decrease opportunities for drought reductions and thus "harden" demand.

Demand hardening examines the relationship between long-term conservation programs and short-term drought reduction efforts. Exhibit C-9 identifies the total reductions that would result from implementation of a 15% DMP (from Exhibit C-8) after implementation of each CPA (Exhibit C-5). With the exception of Industrial demand, the CPA 1 reductions range between 15 and 30%, CPA 2 reductions range between 18 and 35%, and CPA 3 reductions range between 22 and 40%. The question remains however, as to whether these reductions are reasonable and achievable. The DWR, the California Urban Water Conservation Council, and other agencies have all noted difficulties implementing more intensive conservation programs. Because Single Family Residential demand accounts for a large percentage of future demand which is fairly uniform, and for which considerable data exists on how these customer use water, it was selected as the demand hardening case study.

Exhibit C-9
Overall Percent Reduction for each CPA with a 15% DMP
(from 2040 No Action Non drought Demand)

	CPA 1	CPA 2	CPA 3
Single Family	29%	33%	36%
Multi Family	24%	27%	31%
Commercial & Light Industrial	15%	18%	22%
Large Turf	31%	35%	40%
Industrial	5%	6%	8%

Single Family per capita consumption was reviewed after implementation of each of the CPAs and with implementation of the 15% drought management program. Exhibit C-10 shows the results of this analysis. It is important to note that under CPA 3 the non-drought per capita usage in the year 2040 equals the drought per capita usage in 1990. In other words, implementation of CPA 3 will restrict per capita usage to the drought level experienced in 1991, or 106 gallons per capita per day. Also, when the 15% DMP is combined with CPA 3, per capita demand must drop to 80 gallons per capita per day. Inevitably, customers will lose landscaping at these usage levels.

Exhibit C-10
Single Family Residential Demand before and after Drought Reductions
(Gallons per Capita per Day)

	1990	CPA 1 2040	CPA 2 2040	CPA 3 2040
Non-Drought	140	117	112	106
Drought	105	88	84	80

While each customer will have the freedom to choose how to reduce water use during a drought, Exhibit C-11 identifies the level-of-effort required by Single Family customers to achieve a 25% reduction after implementation of each of the CPAs. (A 25% reduction by Single Family customers is needed to achieve a 15% District-wide reduction.) Since customers will have already replaced inefficient fixtures and appliances as part of the long-term conservation program, they will have no choice but to restrict landscape irrigation.

It was concluded that the combination of CPA 3 with the 15% DMP was not a realistic, reasonable scenario. A balance between long-term conservation and short-term drought reductions must be realized to ensure an achievable, reliable demand management program. While CPA 2 was found to be achievable, it places a much larger burden on the District's customers and is not as reliable during droughts. Under CPA 1, CCWD shoulders primary responsibility for achieving water savings from the education and incentive efforts offered to customers. CPA 2 still provides incentives to customers, but expects an increased level of effort from customers in response to the incentives. Also, current customer usage remains below pre-drought ('91-'92) levels. If these usage levels can be sustained, CPA 1 goals may be exceeded without CCWD having to make a financial investment in CPA 2. Therefore it is recommended that CCWD proceed with implementation and monitoring of CPA 1. If future demand exceeds the FWSS projections or if CPA 1 does not yield anticipated savings, it is recommended that CCWD move to implementation of CPA 2.

Monitoring and Tracking Savings

To evaluate the cost-effectiveness of an individual conservation measure, CPA 1, and the Recommended Preferred Alternative overall, the District must estimate how much water is saved under conservation efforts. Estimating savings for individual conservation measures can be difficult, with more accuracy attributed to hardware driven programs. Therefore, early tracking to compare actual and projected savings is a necessity. Also, the District's conservation program should be flexible to respond to changing markets and technologies, particularly since some measures may prove more successful than others. Funding should be allocated to maximize water savings while ensuring that conservation assistance is offered to all customer categories. Monitoring and evaluation of conservation savings and customer demand through program record-keeping practices should be an ongoing process in the near-term Action Plan.

Reporting to CUWCC, USBR and DWR. The annual results of the District's conservation program are currently reported to three agencies. The reporting of savings by the District, and the necessary tracking to more easily facilitate such requirements, should be an integral piece of the implementation of CPA 1. An annual report on the status of the implementation of the Best Management Practices must be submitted to the USBR each December, a requirement since 1994. The report must contain the information requested in the *USBR Guidebook for Preparing Conservation Plans*. The plan reports on the District's conservation activities, including ongoing conservation programs and projects.

CCWD's Conservation Program includes participation in the Memorandum of Understanding Regarding Urban Water Conservation in California (State BMP MOU), signed by the District in 1991. As a signatory, the District is required to complete a system water audit for the Treated Water Service Area once every three years. The completed audit will be attached to the annual State BMP implementation report to the California Urban Water Conservation Council (CUWCC). It is also included in the annual plan update submitted to the USBR.

Many agencies, including local suppliers and statewide and regional planners, are interested in water use data. The District also submits water use statements to the Department of Water Resources (DWR) for compilation and publication in the Bulletin 160 Series - Urban Water Use in California. The collection of statewide water information and production of reports, for the benefit of State and local water planners and users, is an important product of DWR's obligation to the people of California. Water use reports are analyzed and updated on a statewide basis through a cooperative effort among Federal and State agencies and water purveyors within the California Water Plan Update, most recently published in 1994. Such reports are also the basis for forecasting future water use in the State.

C-100272

Exhibit C-11
Residential Use

15% Overall Reduction = 25% Single Family Reduction
(Gallons per Capita per Day)

1990

Normal Year		Drought Year	
Indoor Use	70	Indoor Use	63
		1 less flush/day; shorter showers	
Outdoor Use	70	Outdoor Use	42
		40% less watering; subsistence level	
Total	**140**	**Total**	**105**

2040

	Normal Year		Drought Year	
	Indoor Use	50	Indoor Use	46
	Efficient appliances and fixtures		2 less flushes/day; shorter showers	
CPA 1	Outdoor Use	67	Outdoor Use	42
	5% reduction from 1990 use		Subsistence watering level	
	Total	**117**	**Total**	**88**
	Indoor Use	50	Indoor Use	46
CPA 2	Outdoor Use	62	Outdoor Use	38
	11% reduction from 1990 use		Below subsistence watering	
	Total	**112**	**Total**	**84**
	Indoor Use	50	Indoor Use	46
CPA 3	Outdoor Use	56	Outdoor Use	34
	20% reduction from 1990 use		Lose landscaping	
	Total	**106**	**Total**	**80**

-10

ATTACHMENT 1

The exhibits included in this Attachment present the savings calculations for the following conservation measures: Residential and Non-residential Audits; Water Waste Prohibitions; the Model Landscape Ordinance; and the ULFT Rebate Program. Savings applied to Service Area C were calculated for these measures under each CPA in the years 2000, 2020, and 2040. Exhibits C-1-1 and C-1-2 present savings for the Audit measure; Exhibits C-1-3 and C-1-4 identify savings for the Prohibitions; Exhibits C-1-5 and C-1-6 present savings for the Ordinance; and Exhibit C-1-7 shows savings for the Rebate Program. While savings have not been attributed to Public Information, the success of the CPAs depends on successful implementation of this measure.

The conservation savings are based on coverage, acceptance, and percent savings estimates. The reliability of these estimates decreases as one progresses from CPA 1 to CPA 3. The estimates were based on the desired overall savings goals and the staffing and money allocated to each of the CPAs. A monitoring and evaluation program should be used to validate these estimates. Demand and account assumptions used in the calculations are presented in Exhibits C-1-1 and C-1-2. These calculations should be periodically reviewed along with the demand projections to determine if CCWD is meeting or exceeding its demand management goals. Also, some of the measures may be more successful than others and staff and funding should be allocated to maximize the savings, while minimizing costs. These calculations demonstrate the level of effort CCWD would have to expend to achieve the overall CPA savings goals. Over time, implementation of the measures and the CPAs may differ from those described here.

Exhibit C-1-1
Indoor and Outdoor Residential Audits
(Audits repeated every 10 years)

CPA 1 - Yr 2000	Single Family	Multi Family
Residential		
Households	113,902	47,872
Residential Demand (AF)	51,908	17,303
Annual Audits Assumed	2531	1064
Resulting Coverage	11.1%	11.1%
Acceptance/Retention	20%	20%
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	115.34	38.46

CPA 1 - Yr 2020	Single Family	Multi Family
Residential		
Households	143,103	60,145
Residential Demand (AF)	61,635	20,545
Annual Audits Assumed	3180	1337
Resulting Coverage	22.2%	22.2%
Acceptance/Retention	25%	25%
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	342.38	114.13

CPA 1 - Yr 2040	Single Family	Multi Family
Residential		
Households	156,114	65,613
Residential Demand (AF)	62,933	20,978
Annual Audits Assumed	3469	1458
Resulting Coverage	22.2%	22.2%
Acceptance/Retention	40%	40%
Percent Savings	20%	20%
Total Res Ac-ft/Year Saved	1,118.70	372.90

Exhibit C-1-1 (Continued)
Indoor and Outdoor Residential Audits
(Audits repeated every 10 years)

CPA 2 - Yr 2000	Single Family	Multi Family
Residential		
Households	113,902	47,872
Residential Demand (AF)	51,908	17,303
Annual Audits Assumed	3797	1596
Resulting Coverage	16.7%	16.7%
Acceptance/Retention	20%	20%
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	173.04	57.69

CPA 2 - Yr 2020	Single Family	Multi Family
Residential		
Households	143,103	60,145
Residential Demand (AF)	61,635	20,545
Annual Audits Assumed	4770	2005
Resulting Coverage	33.3%	33.3%
Acceptance/Retention	50%	50%
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	1,027.23	342.45

CPA 2 - Yr 2040	Single Family	Multi Family
Residential		
Households	156,114	65,613
Residential Demand (AF)	62,933	20,978
Annual Audits Assumed	5204	2187
Resulting Coverage	33.3%	33.3%
Acceptance/Retention	70%	70%
Percent Savings	20%	20%
Total Res Ac-ft/Year Saved	2,936.99	978.93

Exhibit C-1-1 (Continued)
Indoor and Outdoor Residential Audits
(Audits repeated every 10 years)

CPA 3 - Yr 2000	Single Family	Multi Family
Residential		
Households	113,902	47,872
Residential Demand (AF)	51,908	17,303
Annual Audits Assumed	7593	3191
Resulting Coverage	33.3%	33.3%
Acceptance/Retention	20%	20%
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	346.03	115.34

CPA 3 - Yr 2020	Single Family	Multi Family
Residential		
Households	143,103	60,145
Residential Demand (AF)	61,635	20,545
Annual Audits Assumed	9540	4010
Resulting Coverage	66.7%	66.7%
Acceptance/Retention	25%	25%
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	1,027.23	342.45

CPA 3 - Yr 2040	Single Family	Multi Family
Residential		
Households	156,114	65,613
Residential Demand (AF)	62,933	20,978
Annual Audits Assumed	10408	4374
Resulting Coverage	66.7%	66.7%
Acceptance/Retention	60%	60%
Percent Savings	20%	20%
Total Res Ac-ft/Year Saved	5,034.83	1,678.16

Exhibit C-1-2
Indoor and Outdoor Residential Audits
(Audits repeated every 10 years)

	Com'l/Lt Ind	Large Turf	Industrial
CPA 1 - Yr 2000			
Non Residential			
Accounts	10,109	4,044	
Demand (AF)	23,292	15,528	48,520
Annual Audits Assumed	337	270	
Resulting Coverage	16.7%	33.4%	
Acceptance/Retention	50%	60%	
Percent Savings	10%	10%	0.50%
Total Ac-ft/Year Saved	194	311	243
CPA 1 - Yr 2020			
Non Residential			
Accounts	15,436	6,175	
Demand (AF)	33,708	22,472	48,520
Annual Audits Assumed	515	412	
Resulting Coverage	33.4%	66.7%	
Acceptance/Retention	70%	70%	
Percent Savings	15%	15%	1.5%
Total Ac-ft/Year Saved	1,181	1,574	728
CPA 1 - Yr 2040			
Non Residential			
Accounts	17,404	6,962	
Demand (AF)	36,126	24,084	48,520
Annual Audits Assumed	580	464	
Resulting Coverage	33.4%	66.6%	
Acceptance/Retention	70%	70%	
Percent Savings	15%	15%	2.5%
Total Ac-ft/Year Saved	1,266	1,685	1,213

C-15

Exhibit C-1-2 (Continued)
Indoor and Outdoor Residential Audits
(Audits repeated every 10 years)

	Com'l/Lt Ind	Large Turf	Industrial
CPA 2 - Yr 2000			
Non Residential			
Accounts	10,109	4,044	
Demand (AF)	23,292	15,528	48,520
Annual Audits Assumed	674	270	
Resulting Coverage	33.3%	33.4%	
Acceptance/Retention	70%	70%	
Percent Savings	10%	10%	0.50%
Total Ac-ft/Year Saved	544	363	243
CPA 2 - Yr 2020			
Non Residential			
Accounts	15,436	6,175	
Demand (AF)	33,708	22,472	48,520
Annual Audits Assumed	1,029	412	
Resulting Coverage	66.7%	66.7%	
Acceptance/Retention	70%	90%	
Percent Savings	15%	20%	2.0%
Total Ac-ft/Year Saved	2,359	2,699	970
CPA 2 - Yr 2040			
Non Residential			
Accounts	17,404	6,962	
Demand (AF)	36,126	24,084	48,520
Annual Audits Assumed	1,160	464	
Resulting Coverage	66.7%	66.6%	
Acceptance/Retention	70%	90%	
Percent Savings	15%	20%	4.0%
Total Ac-ft/Year Saved	2,528	2,889	1,941

Exhibit C-1-2 (Continued)
Indoor and Outdoor Residential Audits
(Audits repeated every 10 years)

	Com'l/Lt Ind	Large Turf	Industrial
CPA 3 - Yr 2000			
Non Residential			
Accounts	10,109	4,044	
Demand (AF)	23,292	15,528	48,520
Annual Audits Assumed	1,011	404	
Resulting Coverage	50%	50%	
Acceptance/Retention	70%	70%	
Percent Savings	15%	20%	1%
Total Ac-ft/Year Saved	1,223	1,087	485
CPA 3 - Yr 2020			
Non Residential			
Accounts	15,436	6,175	
Demand (AF)	33,708	22,472	48,520
Annual Audits Assumed	1,544	617	
Resulting Coverage	100%	100%	
Acceptance/Retention	70%	90%	
Percent Savings	15%	20%	3%
Total Ac-ft/Year Saved	3,539	4,045	1,456
CPA 3 - Yr 2040			
Non Residential			
Accounts	17,404	6,962	
Demand (AF)	36,126	24,084	48,520
Annual Audits Assumed	1,740	696	
Resulting Coverage	100%	100%	
Acceptance/Retention	70%	90%	
Percent Savings	15%	20%	6%
Total Ac-ft/Year Saved	3,793	4,335	2,911

C-17

Exhibit C-1-3
Waste Water Prohibitions

Water Waste Prohibitions
Assume Audit Staff enforces

CPA 1 - Yr 2000	Single Family	Multi Family
Residential		
Residential Demand (AF)	51,908	17,303
% Outside Use	51.4%	40.0%
Outside Demand (AF)	26,681	6,921
Percent Savings	0.50%	0.50%
Total Res Ac-ft/Year Saved	133	35

CPA 1 - Yr 2020		
Residential		
-18 Residential Demand (AF)	61,635	20,545
% Outside Use	51.4%	40.0%
Outside Demand (AF)	31,680	8,218
Percent Savings	0.50%	0.50%
Total Res Ac-ft/Year Saved	158	41

CPA 1 - Yr 2040		
Residential		
Residential Demand (AF)	62,933	20,978
% Outside Use	51.4%	40.0%
Outside Demand (AF)	32,348	8,391
Percent Savings	0.50%	0.50%
Total Res Ac-ft/Year Saved	162	42

Exhibit C-1-3 (Continued)
Waste Water Prohibitions

Water Waste Prohibitions
Assume Audit Staff enforces

	Single Family	Multi Family
CPA 2 - Yr 2000		
Residential		
Residential Demand (AF)	51,908	17,303
% Outside Use	51.4%	40.0%
Outside Demand (AF)	26,681	6,921
Percent Savings	0.50%	0.50%
Total Res Ac-ft/Year Saved	133	35
CPA 2 - Yr 2020		
Residential		
Residential Demand (AF)	61,635	20,545
% Outside Use	51.4%	40.0%
Outside Demand (AF)	31,680	8,218
Percent Savings	1.5%	1.5%
Total Res Ac-ft/Year Saved	475	123
CPA 2 - Yr 2040		
Residential		
Residential Demand (AF)	62,933	20,978
% Outside Use	51.4%	40.0%
Outside Demand (AF)	32,348	8,391
Percent Savings	1.5%	1.5%
Total Res Ac-ft/Year Saved	485	126

C-19

Exhibit C-1-3 (Continued)
Waste Water Prohibitions

Water Waste Prohibitions
Assume Audit Staff enforces

	Single Family	Multi Family
CPA 3 - Yr 2000		
Residential		
Residential Demand (AF)	51,908	17,303
% Outside Use	51.4%	40.0%
Outside Demand (AF)	26,681	6,921
Percent Savings	0.50%	0.50%
Total Res Ac-ft/Year Saved	133	35
CPA 3 - Yr 2020		
Residential		
-20 Residential Demand (AF)	61,635	20,545
% Outside Use	51.4%	40.0%
Outside Demand (AF)	31,680	8,218
Percent Savings	1.5%	1.5%
Total Res Ac-ft/Year Saved	475	123
CPA 3 - Yr 2040		
Residential		
Residential Demand (AF)	62,933	20,978
% Outside Use	51.4%	40.0%
Outside Demand (AF)	32,348	8,391
Percent Savings	2%	2%
Total Res Ac-ft/Year Saved	647	168

Exhibit C-1-4
Waste Water Prohibitions

Water Waste Prohibitions
Assume Audit Staff enforces

CPA 1 - Yr 2000	Com'l/Lt Ind'l	Lg Turf
Non-Residential		
Demand (AF)	23,292	15,528
% Outside Use	20%	90%
Outside Demand (AF)	4,658	13,975
Percent Savings	0.50%	0.50%
Total Ac-ft/Year Saved	23	70

CPA 1 - Yr 2020		
Non-Residential		
Demand (AF)	33,708	22,472
% Outside Use	20%	90%
Outside Demand (AF)	6,742	20,225
Percent Savings	0.50%	0.50%
Total Ac-ft/Year Saved	34	101

CPA 1 - Yr 2040		
Non-Residential		
Demand (AF)	36,126	24,084
% Outside Use	20%	90%
Outside Demand (AF)	7,225	21,676
Percent Savings	0.50%	0.50%
Total Ac-ft/Year Saved	36	108

Exhibit C-1-4 (Continued)
Waste Water Prohibitions

Water Waste Prohibitions
Assume Audit Staff enforces

CPA 2 - Yr 2000	Com'l/Lt Ind'l	Lg Turf
Non-Residential		
Demand (AF)	23,292	17,303
% Outside Use	20%	90%
Outside Demand (AF)	4,658	15,573
Percent Savings	0.50%	0.50%
Total Ac-ft/Year Saved	23	78

CPA 2 - Yr 2020		
Non-Residential		
Demand (AF)	33,708	20,545
% Outside Use	20%	90%
Outside Demand (AF)	6,742	18,491
Percent Savings	1%	1%
Total Ac-ft/Year Saved	67	185

CPA 2 - Yr 2040		
Non-Residential		
Demand (AF)	36,126	20,978
% Outside Use	20%	90%
Outside Demand (AF)	7,225	18,880
Percent Savings	1%	1%
Total Ac-ft/Year Saved	72	189

Exhibit C-1-4 (Continued)
Waste Water Prohibitions

Water Waste Prohibitions
Assume Audit Staff enforces

CPA 3 - Yr 2000	Com'l/Lt Ind'l	Lg Turf
Non-Residential		
Demand (AF)	23,292	17,303
% Outside Use	20%	90%
Outside Demand (AF)	4,658	15,573
Percent Savings	0.50%	0.50%
Total Ac-ft/Year Saved	23	78

CPA 3 - Yr 2020		
Non-Residential		
Demand (AF)	33,708	20,545
% Outside Use	20%	90%
Outside Demand (AF)	6,742	18,491
Percent Savings	1%	1%
Total Ac-ft/Year Saved	67	185

CPA 3 - Yr 2040		
Non-Residential		
Demand (AF)	36,126	20,978
% Outside Use	20%	90%
Outside Demand (AF)	7,225	18,880
Percent Savings	2%	2%
Total Ac-ft/Year Saved	145	378

C-23

Exhibit C-1-5
Model Landscape Ordinances

Model Landscape Ordinances - Landscape Guidelines
New Demand Only

	Single Family	Multi Family
CPA 1 Yr 2000		
Residential		
Residential Demand (AF)	51,908	17,303
New Demand (AF)	4,219	1,407
% Outside Use	51%	40%
Outside New Demand (AF)	2,169	563
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	217	56
CPA 1 - Yr 2020		
Residential		
Residential Demand (AF)	61,635	20,545
New Demand	13,946	3,242
% Outside Use	51%	40%
Outside New Demand (AF)	7,168	1,297
Percent Savings	10%	10%
Total Res Ac-ft/Year Saved	717	130
CPA 1 Yr 2040		
Residential		
Residential Demand (AF)	62,933	20,978
New Demand (AF)	15,244	5,082
% Outside Use	51%	40%
Outside New Demand (AF)	7,835	2,033
Percent Savings	15%	15%
Total Res Ac-ft/Year Saved	1,175	305

Exhibit C-1-5 (Continued)
Model Landscape Ordinances

Model Landscape Ordinances - Landscape Guidelines
New Demand Only

CPA 2 Yr 2000	Single Family	Multi Family
Residential		
Residential Demand (AF)	51,908	17,303
New Demand (AF)	4,219	1,407
% Outside Use	51.4%	40.0%
Outside New Demand (AF)	2,169	563
Percent Savings	15%	15%
Total Res Ac-ft/Year Saved	325	84

CPA 2 Yr 2020		
Residential		
Residential Demand (AF)	61,635	20,545
New Demand (AF)	13,946	3,242
% Outside Use	51.4%	40.0%
Outside New Demand (AF)	7,168	1,297
Percent Savings	15%	15%
Total Res Ac-ft/Year Saved	1,075	195

CPA 2 - Yr 2040		
Residential		
Residential Demand (AF)	62,933	20,978
New Demand (AF)	15,244	5,082
% Outside Use	51.4%	40.0%
Outside New Demand (AF)	7,835	2,033
Percent Savings	20%	20%
Total Res Ac-ft/Year Saved	1,567	407

Exhibit C-1-5 (Continued)
Model Landscape Ordinances

Model Landscape Ordinances - Landscape Guidelines
New Demand Only

CPA 3 Yr 2000	Single Family	Multi Family
Residential		
Residential Demand (AF)	51,908	17,303
New Demand (AF)	4,219	1,407
% Outside Use	51.4%	40.0%
Outside New Demand (AF)	2,169	563
Percent Savings	15%	15%
Total Res Ac-ft/Year Saved	325	84

CPA 3 - Yr 2020		
Residential		
Residential Demand (AF)	61,635	20,545
New Demand (AF)	13,946	4,649
% Outside Use	51.4%	40.0%
Outside New Demand (AF)	7,168	1,860
Percent Savings	20%	20%
Total Res Ac-ft/Year Saved	1,434	372

CPA 3 - Yr 2040		
Residential		
Residential Demand (AF)	62,933	20,978
New Demand (AF)	15,244	5,082
% Outside Use	51.4%	40.0%
Outside New Demand (AF)	7,835	2,033
Percent Savings	25%	25%
Total Res Ac-ft/Year Saved	1,959	508

·26

Exhibit C-1-6
Model Landscape Ordinances

Model Landscape Ordinances - Landscape Guidelines
New Demand Only - Non Residential

Lt Industrial/Commercial Only

	Lt Ind'l/Com'l
CPA 1 Yr 2000	
Non-Residential	
Demand (AF)	23,292
New Demand (AF)	2,214
% Outside Use	20%
Outside New Demand (AF)	443
Percent Savings	10%
Total Res Ac-ft/Year Saved	44

C-27

CPA 1 - Yr 2020	
Non-Residential	
Demand (AF)	33,708
New Demand (AF)	12,630
% Outside Use	20%
Outside New Demand (AF)	2,526
Percent Savings	10%
Total Res Ac-ft/Year Saved	253

CPA 1 Yr 2040	
Non-Residential	
Demand (AF)	36,126
New Demand (AF)	15,048
% Outside Use	20%
Outside New Demand (AF)	3,010
Percent Savings	10%
Total Res Ac-ft/Year Saved	301

Exhibit C-1-6 (Continued)
Model Landscape Ordinances

Model Landscape Ordinances - Landscape Guidelines
New Demand Only - Non Residential

Lt Industrial/Commercial Only

	Lt Ind'l/Com'l
CPA 2 Yr 2000	
Non-Residential	
Demand (AF)	23,292
New Demand (AF)	2,214
% Outside Use	20%
Outside New Demand (AF)	443
Percent Savings	12%
Total Res Ac-ft/Year Saved	53

·28

CPA 2 Yr 2020	
Non-Residential	
Demand (AF)	33,708
New Demand (AF)	12,630
% Outside Use	20%
Outside New Demand (AF)	2,526
Percent Savings	12%
Total Res Ac-ft/Year Saved	303

CPA 2 - Yr 2040	
Non-Residential	
Demand (AF)	36,126
New Demand (AF)	15,048
% Outside Use	20%
Outside New Demand (AF)	3,010
Percent Savings	12%
Total Res Ac-ft/Year Saved	361

Exhibit C-1-6 (Continued)
Model Landscape Ordinances

Model Landscape Ordinances - Landscape Guidelines
New Demand Only - Non Residential

Lt Industrial/Commercial Only

	Lt Ind'l/Com'l
CPA 3 Yr 2000	
Non-Residential	
Demand (AF)	23,292
New Demand (AF)	2,214
% Outside Use	20%
Outside New Demand (AF)	443
Percent Savings	15%
Total Res Ac-ft/Year Saved	66
CPA 3 - Yr 2020	
Non-Residential	
Demand (AF)	33,708
New Demand (AF)	12,630
% Outside Use	20%
Outside New Demand (AF)	2,526
Percent Savings	15%
Total Res Ac-ft/Year Saved	379
CPA 3 - Yr 2040	
Non-Residential	
Demand (AF)	36,126
New Demand (AF)	15,048
% Outside Use	20%
Outside New Demand (AF)	3,010
Percent Savings	15%
Total Res Ac-ft/Year Saved	451

Exhibit C-1-7
ULFT Rebate Program
CPA 1

Year	Alt C Households	Existing Toilet Repl Base (1995)	Natural Replacement	Incentive Replacement CPA 1	Remaining Base	Annual $ Incentives	Annual Savings Nat'l Repl't (Ac-Ft)	Annual Savings Incent (Ac-Ft)	Annual Savings Total (Ac-Ft)	Cost per Acre-Foot CPA 1
1995	148,470	133,623	3,341	1,905	128,378	300,000	114	65	179	4,612
1996	151,170	128,378	3,341	1,905	123,132	300,000	228	130	358	2,306
1997	153,870	123,132	3,341	1,905	117,887	300,000	342	195	537	1,537
1998	156,570	117,887	3,341	1,905	112,642	300,000	456	260	716	1,153
1999	159,270	112,642	3,341	1,905	107,396	300,000	570	325	896	922
2000	161,920	107,396	3,341	1,905	102,151	300,000	684	390	1,075	769
2001	164,560	102,151	3,341	1,905	96,906	300,000	799	455	1,254	659
2002	167,200	96,906	3,341	1,905	91,660	300,000	913	520	1,433	577
2003	169,840	91,660	3,341	1,905	86,415	300,000	1,027	585	1,612	512
2004	172,480	86,415	3,341	1,905	81,170	300,000	1,141	650	1,791	461
2005	175,120	81,170	3,341	1,905	75,924	300,000	1,255	715	1,970	419
2006	177,760	75,924	3,341	1,905	70,679	300,000	1,369	781	2,149	384
2007	180,400	70,679	3,341	1,905	65,434	300,000	1,483	846	2,328	355
2008	183,040	65,434	3,341	1,905	60,188	300,000	1,597	911	2,508	329
2009	185,680	60,188	3,341	1,905	54,943	300,000	1,711	976	2,687	307
2010	188,320	54,943	3,341	1,905	49,698	300,000	1,825	1,041	2,866	288
2011	189,830	49,698	3,341	1,905	44,452	300,000	1,939	1,106	3,045	271
2012	191,340	44,452	3,341	1,905	39,207	300,000	2,053	1,171	3,224	256
2013	192,850	39,207	3,341	1,905	33,962	300,000	2,167	1,236	3,403	243
2014	194,360	33,962	3,341	1,905	28,716	300,000	2,281	1,301	3,582	231
2015	195,870	28,716	3,341	1,905	23,471	300,000	2,396	1,366	3,761	220
2016	197,380	23,471	3,341	1,905	18,226	300,000	2,510	1,431	3,941	210
2017	198,890	18,226	3,341	1,905	12,980	300,000	2,624	1,496	4,120	201
2018	200,400	12,980	3,341	1,905	7,735	300,000	2,738	1,561	4,299	192
2019	201,910	7,735	3,341	1,905	2,490	300,000	2,852	1,626	4,478	184
2020	203,430	2,490	2,490	0	0	0	2,937	1,626	4,563	0
2021	204,530	0	0	0	0	0	2,937	1,626	4,563	0
2022	205,630	0	0	0	0	0	2,937	1,626	4,563	0
2023	206,730	0	0	0	0	0	2,937	1,626	4,563	0
2024	207,830	0	0	0	0	0	2,937	1,626	4,563	0
2025	208,930	0	0	0	0	0	2,937	1,626	4,563	0
2026	210,030	0	0	0	0	0	2,937	1,626	4,563	0
2027	211,130	0	0	0	0	0	2,937	1,626	4,563	0
2028	212,230	0	0	0	0	0	2,937	1,626	4,563	0
2029	213,330	0	0	0	0	0	2,937	1,626	4,563	0
2030	214,380	0	0	0	0	0	2,937	1,626	4,563	0
2031	215,140	0	0	0	0	0	2,937	1,626	4,563	0
2032	215,900	0	0	0	0	0	2,937	1,626	4,563	0
2033	216,660	0	0	0	0	0	2,937	1,626	4,563	0
2034	217,420	0	0	0	0	0	2,937	1,626	4,563	0
2035	218,180	0	0	0	0	0	2,937	1,626	4,563	0
2036	218,940	0	0	0	0	0	2,937	1,626	4,563	0
2037	219,700	0	0	0	0	0	2,937	1,626	4,563	0
2038	220,460	0	0	0	0	0	2,937	1,626	4,563	0
2039	221,220	0	0	0	0	0	2,937	1,626	4,563	0
2040	221,930	0	0	0	0	0	2,937	1,626	4,563	0
Totals/Check		133,623	86,004	47,619		7,500,000	98,747	55,286	154,033	136

-30

Exhibit C-1-7 (Continued)
ULFT Rebate Program
CPA 2

Year	Alt C Households	Existing Toilet Repl Base (1995)	Natural Replacement	Incentive Replacement CPA 2	Remaining Base	Annual $ Incentives	Annual Savings Nat'l Repl't (Ac-Ft)	Annual Savings Incent (Ac-Ft)	Annual Savings Total (Ac-Ft)	Cost per Acre-Foot CPA 2
1995	148,470	133,623	3,341	2,143	128,140	337,500	114	73	187	4,612
1996	151,170	128,140	3,341	2,143	122,656	337,500	228	146	374	2,306
1997	153,870	122,656	3,341	2,143	117,173	337,500	342	220	562	1,537
1998	156,570	117,173	3,341	2,143	111,689	337,500	456	293	749	1,153
1999	159,270	111,689	3,341	2,143	106,206	337,500	570	366	936	922
2000	161,920	106,206	3,341	2,143	100,722	337,500	684	439	1,123	769
2001	164,560	100,722	3,341	2,143	95,239	337,500	799	512	1,311	659
2002	167,200	95,239	3,341	2,143	89,756	337,500	913	585	1,498	577
2003	169,840	89,756	3,341	2,143	84,272	337,500	1,027	659	1,685	512
2004	172,480	84,272	3,341	2,143	78,789	337,500	1,141	732	1,872	461
2005	175,120	78,789	3,341	2,143	73,305	337,500	1,255	805	2,060	419
2006	177,760	73,305	3,341	2,143	67,822	337,500	1,369	878	2,247	384
2007	180,400	67,822	3,341	2,143	62,338	337,500	1,483	951	2,434	355
2008	183,040	62,338	3,341	2,143	56,855	337,500	1,597	1,024	2,621	329
2009	185,680	56,855	3,341	2,143	51,372	337,500	1,711	1,098	2,809	307
2010	188,320	51,372	3,341	2,143	45,888	337,500	1,825	1,171	2,996	288
2011	189,830	45,888	3,341	2,143	40,405	337,500	1,939	1,244	3,183	271
2012	191,340	40,405	3,341	2,143	34,921	337,500	2,053	1,317	3,370	256
2013	192,850	34,921	3,341	2,143	29,438	337,500	2,167	1,390	3,558	243
2014	194,360	29,438	3,341	2,143	23,954	337,500	2,281	1,463	3,745	231
2015	195,870	23,954	3,341	2,143	18,471	337,500	2,396	1,537	3,932	220
2016	197,380	18,471	3,341	2,143	12,987	337,500	2,510	1,610	4,119	210
2017	198,890	12,987	3,341	2,143	7,504	337,500	2,624	1,683	4,307	201
2018	200,400	7,504	3,341	2,143	2,021	337,500	2,738	1,756	4,494	192
2019	201,910	2,021	2,021	0	0	0	2,807	1,756	4,563	0
2020	203,430	0	0	0	0	0	2,807	1,756	4,563	0
2021	204,530	0	0	0	0	0	2,807	1,756	4,563	0
2022	205,630	0	0	0	0	0	2,807	1,756	4,563	0
2023	206,730	0	0	0	0	0	2,807	1,756	4,563	0
2024	207,830	0	0	0	0	0	2,807	1,756	4,563	0
2025	208,930	0	0	0	0	0	2,807	1,756	4,563	0
2026	210,030	0	0	0	0	0	2,807	1,756	4,563	0
2027	211,130	0	0	0	0	0	2,807	1,756	4,563	0
2028	212,230	0	0	0	0	0	2,807	1,756	4,563	0
2029	213,330	0	0	0	0	0	2,807	1,756	4,563	0
2030	214,380	0	0	0	0	0	2,807	1,756	4,563	0
2031	215,140	0	0	0	0	0	2,807	1,756	4,563	0
2032	215,900	0	0	0	0	0	2,807	1,756	4,563	0
2033	216,660	0	0	0	0	0	2,807	1,756	4,563	0
2034	217,420	0	0	0	0	0	2,807	1,756	4,563	0
2035	218,180	0	0	0	0	0	2,807	1,756	4,563	0
2036	218,940	0	0	0	0	0	2,807	1,756	4,563	0
2037	219,700	0	0	0	0	0	2,807	1,756	4,563	0
2038	220,460	0	0	0	0	0	2,807	1,756	4,563	0
2039	221,220	0	0	0	0	0	2,807	1,756	4,563	0
2040	221,930	0	0	0	0	0	2,807	1,756	4,563	0
Totals/Check		133,623	82,195	51,429		8,100,000	95,978	60,587	156,557	134

C-31

Exhibit C-1-7 (Continued)
ULFT Rebate Program
CPA 3

Year	AR C Households	Existing Toilet Repl Base (1995)	Natural Replacement	Incentive Replacement CPA 3	Remaining Base	Annual $ Incentives	Annual Savings Nat'l Repl't (Ac-Ft)	Annual Savings Incent (Ac-Ft)	Annual Savings Total (Ac-Ft)	Cost per Acre-Foot CPA 3
1995	148,470	133,623	3,341	2,143	128,140	450,000	114	73	187	6,150
1996	151,170	128,140	3,341	2,143	122,656	450,000	228	146	374	3,075
1997	153,870	122,656	3,341	2,143	117,173	450,000	342	220	562	2,050
1998	156,570	117,173	3,341	2,143	111,689	450,000	456	293	749	1,537
1999	159,270	111,689	3,341	2,143	106,206	450,000	570	366	936	1,230
2000	161,920	106,206	3,341	2,143	100,722	450,000	684	439	1,123	1,025
2001	164,560	100,722	3,341	2,143	95,239	450,000	799	512	1,311	879
2002	167,200	95,239	3,341	2,143	89,756	450,000	913	585	1,498	769
2003	169,840	89,756	3,341	2,143	84,272	450,000	1,027	659	1,685	683
2004	172,480	84,272	3,341	2,143	78,789	450,000	1,141	732	1,872	615
2005	175,120	78,789	3,341	2,143	73,305	450,000	1,255	805	2,060	559
2006	177,760	73,305	3,341	2,143	67,822	450,000	1,369	878	2,247	512
2007	180,400	67,822	3,341	2,143	62,338	450,000	1,483	951	2,434	473
2008	183,040	62,338	3,341	2,143	56,855	450,000	1,597	1,024	2,621	439
2009	185,680	56,855	3,341	2,143	51,372	450,000	1,711	1,098	2,809	410
2010	188,320	51,372	3,341	2,143	45,888	450,000	1,825	1,171	2,996	384
2011	189,830	45,888	3,341	2,143	40,405	450,000	1,939	1,244	3,183	362
2012	191,340	40,405	3,341	2,143	34,921	450,000	2,053	1,317	3,370	342
2013	192,850	34,921	3,341	2,143	29,438	450,000	2,167	1,390	3,558	324
2014	194,360	29,438	3,341	2,143	23,954	450,000	2,281	1,463	3,745	307
2015	195,870	23,954	3,341	2,143	18,471	450,000	2,396	1,537	3,932	293
2016	197,380	18,471	3,341	2,143	12,987	450,000	2,510	1,610	4,119	280
2017	198,890	12,987	3,341	2,143	7,504	450,000	2,624	1,683	4,307	267
2018	200,400	7,504	3,341	2,143	2,021	450,000	2,738	1,756	4,494	256
2019	201,910	2,021	2,021	0	0	0	2,807	1,756	4,563	0
2020	203,430	0	0	0	0	0	2,807	1,756	4,563	0
2021	204,530	0	0	0	0	0	2,807	1,756	4,563	0
2022	205,630	0	0	0	0	0	2,807	1,756	4,563	0
2023	206,730	0	0	0	0	0	2,807	1,756	4,563	0
2024	207,830	0	0	0	0	0	2,807	1,756	4,563	0
2025	208,930	0	0	0	0	0	2,807	1,756	4,563	0
2026	210,030	0	0	0	0	0	2,807	1,756	4,563	0
2027	211,130	0	0	0	0	0	2,807	1,756	4,563	0
2028	212,230	0	0	0	0	0	2,807	1,756	4,563	0
2029	213,330	0	0	0	0	0	2,807	1,756	4,563	0
2030	214,380	0	0	0	0	0	2,807	1,756	4,563	0
2031	215,140	0	0	0	0	0	2,807	1,756	4,563	0
2032	215,900	0	0	0	0	0	2,807	1,756	4,563	0
2033	216,660	0	0	0	0	0	2,807	1,756	4,563	0
2034	217,420	0	0	0	0	0	2,807	1,756	4,563	0
2035	218,180	0	0	0	0	0	2,807	1,756	4,563	0
2036	218,940	0	0	0	0	0	2,807	1,756	4,563	0
2037	219,700	0	0	0	0	0	2,807	1,756	4,563	0
2038	220,460	0	0	0	0	0	2,807	1,756	4,563	0
2039	221,220	0	0	0	0	0	2,807	1,756	4,563	0
2040	221,930	0	0	0	0	0	2,807	1,756	4,563	0
Totals/Check		133,623	82,195	51,429		10,800,000	95,970	60,587	156,557	178

-32

ATTACHMENT 2

This Attachment to Technical Appendix C provides additional detail on the annual cost and staffing estimates prepared for each Conservation Program Alternative applied to Service Area C. Estimates were developed for the years 2000, 2020, and 2040. Both permanent and temporary staff will be needed to implement the CPAs with the exception of 1 maintenance staff associated with the Systems Operations and Loss Reductions measure. Exhibit C-2-1 identifies the type of positions and salaries of the CPAs' support staff. Benefits have been included in the salary dollars. To reflect the total cost of employment, equipment costs, supplies, training and District administrative support would be added.

Exhibit C-2-1
Staffing for Conservation Programs

	Salary
Permanent Staff (P)	
P1 - Program Administrator	65,000
P2 - Conservation Specialist	55,000
P3 - Conservation Specialist	40,000
Temporary Staff (T)	
T - Auditors	17,000

Exhibit C-2-2 identifies the number of audits by customer category that are included in each of the CPAs. BMP mandates require that CCWD offer indoor and outdoor water audits to the top 20% of its customers on a repeating cycle. CPA 1 meets this requirement and CPA 2 and CPA 3 exceed it. CPA 3, the most aggressive conservation program, requires the most staff and CPA 1, a more moderate program, requires the least. Exhibits C-2-3, C-2-4, and C-2-5 (included below and on the following pages) identify the total and FTE staffing needed for each of the CPAs. The staffing charts are disaggregated by measure. Audits are the most labor intensive measure, with dedicated staff ranging in the year 2040 from 12.8 FTEs in CPA 1 to 32.3 FTEs in CPA 3.

C-33

Exhibit C-2-2
Audits by Customer Category

	2000			2020			2040		
	CPA 1	CPA 2	CPA 3	CPA 1	CPA 2	CPA 3	CPA 1	CPA 2	CPA 3
Single Family	2,531	3,797	7,593	3,180	4,770	9,540	3,469	5,204	10,408
Multi Family	1,064	1,596	3,191	1,337	2,005	4,010	1,458	2,187	4,374
Commercial & Industrial	337	674	1,011	515	1,029	1,544	580	1,160	1,740
Lg Turf	270	270	404	412	412	617	464	464	696
Total	**4,202**	**6,337**	**12,199**	**5,444**	**8,216**	**15,711**	**5,971**	**9,015**	**17,218**

Exhibit C-2-3
Staffing Requirements for Conservation Program Alternative 1

	CPA 1 - Year 2000				CPA 1 - Year 2020				CPA 1 - Year 2040			
Conservation Measures	P1	P2	P3	T	P1	P2	P3	T	P1	P2	P3	T
Public Information	1.0		0.5		1.0		0.5		1.0		0.5	
Pricing and Incentives												
Ordinances/Plan Reviews		0.1				0.2				0.3		
Audits												
Residential		1.9	0.9	3.7		2.3	1.2	4.7		2.6	1.3	5.1
Commercial & Lt Industrial		0.8		1.1		1.3		1.7		1.5		1.9
Large Turf		1.3		1.8		2.1		2.7		2.3		3.1
Industrial		Consultants will be used.				Consultants will be used.				Consultants will be used.		
Audit SubTotal		4.0	0.9	6.6		5.7	1.2	9.1		6.4	1.3	10.1
ULFT Rebate Program		1.0		1.0		1.0		1.0		Measure ends in 2020.		
Total Staff	1.0	5.1	1.4	7.6	1.0	6.9	1.7	10.1	1.0	6.7	1.8	10.1
Full Time Equivalent (FTE)	1.0	5.1	1.4	3.8	1.0	6.9	1.7	5.1	1.0	6.7	1.8	5.1
	Total FTE =			11.3	Total FTE =			14.7	Total FTE =			14.6

Note: The System Operation and Loss Reduction Measure would add 1 maintenance staff to each of the totals.

-34

Permanent Staff (P)
P1 - Program Administrator
P2 - Conservation Specialist
P3 - Conservation Specialist

Temporary Staff (T)
T - Auditors

Temporary staff are half-time (0.5 FTE each).

Exhibit C-2-4
Staffing Requirements for Conservation Program Alternative 2

Conservation Measures	CPA 2 - Year 2000 P1	P2	P3	T	CPA 2 - Year 2020 P1	P2	P3	T	CPA 2 - Year 2040 P1	P2	P3	T
Public Information	1.0		1.0		1.0		1.0		1.0		1.0	
Pricing and Incentives												
Ordinances/Plan Reviews		0.2				0.3				0.4		
Audits												
Residential		2.8	1.4	5.6		3.5	1.8	7.0		3.8	1.9	7.7
Commercial & Lt Industrial		1.7		2.2		2.6		3.4		2.9		3.9
Large Turf		1.3		1.8		2.1		2.7		2.3		3.1
Industrial		Consultants will be used.				Consultants will be used.				Consultants will be used.		
Audit SubTotal		5.8	1.4	9.6		8.2	1.8	13.1		9.0	1.9	14.7
ULFT Rebate Program		1.0		1.0		1.0		1.0		Measure ends in 2020.		
Total Staff	1.0	7.0	2.4	10.6	1.0	9.5	2.8	14.1	1.0	9.4	2.9	14.7
FTE Staff	1.0	7.0	2.4	5.3	1.0	9.5	2.8	7.1	1.0	9.4	2.9	7.4
		Total FTE =		15.7		Total FTE =		20.4		Total FTE =		20.7

Note: The System Operation and Loss Reduction Measure would add 1 maintenance staff to each of the totals.

Permanent Staff (P)
P1 - Program Administrator
P2 - Conservation Specialist
P3 - Conservation Specialist

Temporary Staff (T)
T - Auditors

Temporary staff are half-time (0.5 FTE each).

Exhibit C-2-5
Staffing Requirements for Conservation Program Alternative 3

Conservation Measures	CPA 3 - Year 2000 P1	P2	P3	T	CPA 3 - Year 2020 P1	P2	P3	T	CPA 3 - Year 2040 P1	P2	P3	T
Public Information	1.0		1.5		1.0		1.5		1.0		1.5	
Pricing and Incentives		0.5				0.5				0.5		
Ordinances/Plan Reviews		0.3				0.4				0.5		
Audits												
Residential		5.6	2.8	11.2		7.0	3.5	14.1		7.7	3.8	15.3
Commercial & Lt Industrial		2.5		3.4		3.9		5.1		4.4		5.8
Large Turf		2.0		2.7		3.1		4.1		3.5		4.6
Industrial		Consultants will be used.				Consultants will be used.				Consultants will be used.		
Audit SubTotal		10.1	2.8	17.3		14.0	3.5	23.3		15.6	3.8	25.7
ULFT Rebate Program		1.0		1.0		1.0		1.0		Measure ends in 2020.		
Total Staff	1.0	11.9	4.3	18.3	1.0	15.9	5.0	24.3	1.0	16.6	5.3	25.7
FTE Staff	1.0	11.9	4.3	9.15	1.0	15.9	5.0	12.2	1.0	16.6	5.3	12.9
		Total FTE =		**26.4**		**Total FTE =**		**34.1**		**Total FTE =**		**35.8**

Note: The System Operation and Loss Reduction Measure would add 1 maintenance staff to each of the totals.

-36

Permanent Staff (P)
P1 - Program Administrator
P2 - Conservation Specialist
P3 - Conservation Specialist

Temporary Staff (T)
T - Auditors

Temporary staff are half-time (0.5 FTE each).

Audits are the most expensive measure, followed by the ULFT Rebate Program. Most of the Audit costs are associated with staffing. Most of the ULFT Rebate Program costs are associated with rebate dollars. The rebate amounts vary between $75 under CPA 1 and CPA 2 to $100 under CPA 3. Exhibit C-2-6 below provides additional detail on the ULFT Replacement Program assumptions and costs. Exhibits C-2-7 to C-2-15 (included on the following pages) present annual costs by measure for each of the CPA in the years 2000, 2020, and 2040.

Exhibit C-2-6
ULFT Replacement Assumptions

Base Year	1995
Average Toilet Life (Years)	40
"Natural" Replacement Rate	2.5%
Gallons per flush (conventional toilet)	6.0
Gallons per flush (low-flush toilet)	3.5
Gallons per flush (ULFT)	1.6
Distribution of Conventional Toilets	50%
Distribution of Low-flush Toilets	40%
Distribution of ULFTs	10%
Percent of Toilets to be replaced	90%
Weighted Gallons per flush for Toilets to be replaced	4.4
Savings per flush after replacement w/ULFTs	2.8
Flushes per person per day	4.0
Annual Savings per person (gallons)	4,091
Household Size	2.72
Annual Savings per Household (gallons)	11,127
Annual Savings per person (Acre-feet)	0.0126
Annual Savings per Household (Acre-feet)	0.0341
Toilets per Household	2.1
Annual Savings per toilet (Acre-feet)	**0.0163**

	Rebate Amount	Toilets Replaced per year	
		Residential	Commercial
CPA 1	$75	4,000	600
CPA 2	$75	4,500	675
CPA 3	$100	4,500	675

Exhibit C-2-7
Conservation Program Alternative 1 Costs in the Year 2000

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	107,000	40,000		90,000	237,000
Pricing and Incentives					0
Ordinances/Plan Reviews	7,000				7,000
Audits					
Residential	256,000	40,000			296,000
Commercial & Lt Industrial	83,000	10,000	5,000		98,000
Large Turf	132,000	10,000	5,000		147,000
Industrial				10,000	10,000
ULFT Rebate Program	92,000	30,000	345,000		467,000
Total					**1,375,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-8
Conservation Program Alternative 1 Costs in the Year 2020

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	107,000	40,000		90,000	237,000
Pricing and Incentives					0
Ordinances/Plan Reviews	14,000				14,000
Audits					
Residential	322,000	50,000			372,000
Commercial & Lt Industrial	126,000	15,000	5,000		146,000
Large Turf	202,000	20,000	5,000		227,000
Industrial				10,000	10,000
ULFT Rebate Program	92,000	30,000	345,000		467,000
Total					**1,586,000**

C-39

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-9
Conservation Program Alternative 1 Costs in the Year 2040

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	107,000	40,000		90,000	237,000
Pricing and Incentives					0
Ordinances/Plan Reviews	22,000				22,000
Audits					
Residential	351,000	60,000			411,000
Commercial & Lt Industrial	142,000	20,000	5,000		167,000
Large Turf	228,000	20,000	5,000		253,000
Industrial				10,000	10,000
ULFT Rebate Program					0
Total					**1,213,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-10
Conservation Program Alternative 2 Costs in the Year 2000

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	133,000	50,000		190,000	373,000
Pricing and Incentives				1,000	1,000
Ordinances/Plan Reviews	14,000				14,000
Audits					
Residential	384,000	60,000			444,000
Commercial & Lt Industrial	165,000	20,000	10,000		195,000
Large Turf	132,000	10,000	10,000		152,000
Industrial				20,000	20,000
ULFT Rebate Program	95,000	30,000	388,000		513,000
Total					**1,825,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-11
Conservation Program Alternative 2 Costs in the Year 2020

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	133,000	50,000		190,000	373,000
Pricing and Incentives					1,000
Ordinances/Plan Reviews	22,000				22,000
Audits					
Residential	483,000	80,000			563,000
Commercial & Lt Industrial	253,000	30,000	10,000		293,000
Large Turf	202,000	20,000	10,000		232,000
Industrial				20,000	20,000
ULFT Rebate Program	95,000	30,000	388,000		513,000
Total					**2,130,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-12
Conservation Program Alternative 2 Costs in the Year 2040

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	133,000	50,000		190,000	373,000
Pricing and Incentives				1,000	1,000
Ordinances/Plan Reviews	29,000				29,000
Audits					
Residential	527,000	90,000			617,000
Commercial & Lt Industrial	285,000	40,000	10,000		335,000
Large Turf	228,000	20,000	10,000		258,000
Industrial				20,000	20,000
ULFT Rebate Program					0
Total					**1,746,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-13
Conservation Program Alternative 3 Costs in the Year 2000

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	159,000	60,000		290,000	509,000
Pricing and Incentives	36,000			2,000	38,000
Ordinances/Plan Reviews	22,000				22,000
Audits					
Residential	769,000	120,000			889,000
Commercial & Lt Industrial	248,000	30,000	15,000		293,000
Large Turf	198,000	15,000	15,000		228,000
Industrial				30,000	30,000
ULFT Rebate Program	92,000	30,000	518,000		640,000
Total					**2,762,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-14
Conservation Program Alternative 3 Costs in the Year 2020

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	159,000	60,000		290,000	509,000
Pricing and Incentives	36,000			2,000	38,000
Ordinances/Plan Reviews	29,000				29,000
Audits					
Residential	966,000	150,000			1,116,000
Commercial & Lt Industrial	379,000	45,000	15,000		439,000
Large Turf	303,000	30,000	15,000		348,000
Industrial				30,000	30,000
ULFT Rebate Program	95,000	30,000	518,000		643,000
Total					**3,265,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Exhibit C-2-15
Conservation Program Alternative 3 Costs in the Year 2040

Conservation Measures	Total Salaries & Benefits	Equipment & Supplies	Rebates & Incentives	Lump Sum Estimates	Annual Costs
System Operations and Loss Reductions	72,000	41,000			113,000
Public Information (including Administration)	159,000	60,000		290,000	509,000
Pricing and Incentives	38,000				38,000
Ordinances/Plan Reviews	36,000				36,000
Audits					
Residential	1,050,000	180,000			1,230,000
Commercial & Lt Industrial	427,000	60,000	15,000		502,000
Large Turf	342,000	30,000	15,000		387,000
Industrial				30,000	30,000
ULFT Rebate Program					0
Total					**2,845,000**

Salary benefits multiplier is 0.315 for permanent staff
Salary benefits multiplier is 0.14 for temporary staff

Technical Appendix D: Supply Components Defined

SUMMARY

The purpose of this Technical Appendix (TA) is to provide additional detail on the District's potential water supply opportunities. It includes a discussion of the impact of water rights on transfers and provides additional detail on select water supply opportunities described in Chapter 4 of the FWSS. As desalination is not being considered as a short-term action under the District's overall Implementation Plan, the FWSS chapters do not include detailed information on that component. Transfer pathways and conveyance needs for individual components being considered under desalination are therefore discussed at a more detailed level for this TA. In addition, water banking opportunities are addressed in more detail in this TA than the FWSS chapters. This TA is not an all inclusive discussion of water supply opportunities and should be reviewed in conjunction with Chapter 4.

Water Rights and Transfers

Any future water supply transferred to the District would be subject to the water right conditions of the supply source. The following discussion summarizes the various types and characteristics of water rights that could affect water transfers.

Pre-1914 Appropriations. Prior to the 1914 enactment of the Water Commission Act, appropriative water rights were established by posting notices at the point of diversion and/or filing with the county in which the diversion would be made. To establish that such a right exists, it would be necessary for the holder to demonstrate continuous use of water subsequent to the posting/filing. Pre-1914 water rights are not subject to the jurisdiction of the SWRCB and can be transferred to another party without SWRCB review. However, if injury to fish, wildlife or other public trust uses or to another water rights holder could result from a transfer, the action could be challenged in court.

Post-1914 Appropriations. Subsequent to enactment of the Water Commission Act, a water user is required to file a water right application with the SWRCB. The SWRCB then makes a determination of the availability of unappropriated water and issues a permit for appropriation subject to availability of water. Such availability is subject to prior appropriations and satisfaction of other public interest needs. If approved, the SWRCB will issue a license to appropriate water. Transfers of post-1914 water rights under permit or license from the SWRCB require a petition to the SWRCB for a change in place of use and/or purpose of use and, in most cases, a change in point of diversion. Special statutory procedures have been adopted for such transfers. It would also be necessary to demonstrate that injury to other water rights holders, or to fish and wildlife values, has not occurred. This may require that the historical return flows continue to be provided and that the transfer quantity is limited to historical consumptive use.

Riparian. Riparian water rights are an element of land ownership and allow beneficial use of natural flows on lands that abut a water course. Riparian users have the highest priority. Among riparian users, there is equal standing in sharing the available supply if it is not sufficient to meet all of the beneficial uses of the riparian water rights holders. Riparian water rights cannot be transferred from the abutting property. Legislation has recently been introduced in State legislative sessions to permit transfers of riparian water, but it has not passed.

Prescriptive Water Rights. A prescriptive water right is one that is secured by openly hostile and adverse use established over time against another party's appropriative water right. It could be from either a pre-1914 right or post-1914 right. In certain areas, it could be the use of groundwater. Transfer of prescriptive rights are unlikely to be common or substantial.

Transfers between CVP Contractors. Special transfer provisions were established in the CVPIA for transfers between CVP Contractors. Section 3405 (a)(1)(M) provides that transfers between CVP contractors within counties, watersheds or other areas of origin be limited by the following conditions: "No transfer or combination of transfers

authorized by this subsection shall exceed, in any year, the average annual quantity of water under contract actually delivered to the contracting district or agency during the last three years of normal water delivery prior to the date of enactment of this title" and "the water subject to any transfer undertaken pursuant to this subsection shall be limited to water that would have been consumptively used or irretrievably lost to beneficial use during the year or years of the transfer."

The Bureau of Reclamation has issued interim guidelines for implementation of project water transfers that are consistent with Section 3405 (a)(1)(M). The Bureau of Reclamation has also issued guidelines for transfer of base supply as defined and recognized under the Sacramento River Water Rights Settlement contracts. These draft guidelines include quantification of base supply, criteria for evaluating transfers that involve changes in cropping patterns, and criteria for determining impacts of transfers on groundwater. The USBR has indicated that the guidelines are currently being revised and that the revised draft guidelines will be significantly different than the current draft criteria.

It is not entirely clear how Section 3405 (a)(1)(M) of the CVPIA would apply to base water inasmuch as appropriative rights typically provide for a maximum rate of diversion throughout a designated period. Actual water rights depend on beneficial use and are therefore limited to the amounts that can be reasonably applied and used. It seems unlikely that the interpretation of subparagraph (M), which is understood to apply to CVP project water, would apply to base water. Before attempting to transfer the full contract project supply, as opposed to just the consumptive use, an administrative interpretation from the Bureau should be obtained on this matter.

Water Supply Transfers

CCWD could implement water supply transfers from a variety of surface water supply sources, as discussed in Chapter 4 of the FWSS. Transfers of surface water would, in most instances, involve sources not under the direct control or ownership of CCWD. In such cases, CCWD could implement any of the following transfer alternatives: surplus surface water supplies; water use reduction activities such as land fallowing, crop shifts or agricultural water conservation measures; or groundwater substitution. Additional surface water yields could also be developed by capturing currently unregulated flows and storing them from one year to the next in a new surface water reservoir.

CCWD could also obtain supplemental water through participation in the DWR Drought Water Bank (established from year to year). The DWR acts as a broker in taking requests for water from agency purchasers and arranging to buy water from willing sellers. Such sellers have provided water by fallowing, groundwater pumping, water conservation and storage releases from areas throughout the Central Valley.

Potential Future Water Supply Sources

Potential future water supply sources are discussed in considerable detail in Chapter 4. The remainder of this Technical Appendix provides additional details on select options under consideration by the District. This information, in conjunction with Chapter 4, presents the District's current body of knowledge regarding all potential future water supply sources. Options discussed in this TA are not necessarily any more promising than water supply alternatives discussed only in Chapter 4.

Water Use Reduction Opportunities

Crop Shifts. The following crop shift discussion supplements information provided in Chapter 4 of the FWSS. The greatest amount of savings per acre can result from switching from crops such as alfalfa and pasture, which consume about 3 to 3.5 ac-ft/yr of water per acre in the Central Valley, to barley or beans which consume about 1 to 1.5 ac-ft/yr of water per acre (DWR, 1974). Alfalfa and pasture have several years of life and the flexibility of shifting to other crops is more limited when considering short-term supplies. Annual crops such as corn, tomatoes and sugar beets, which consume about 2, 2.5 and 3 ac-ft/yr per acre (DWR, 1974), respectively, offer greater flexibility for short-term supplies. Rice consumes about 4 ac-ft/yr of water per acre but is typically grown on soils not readily

suitable for other crops. With the exception of rice, these crops offer excellent potential for long-term crop shifts to augment the District's water supply.

Regional Availability of Surface Water Supply Opportunities

The following discussion provides additional detail on potential transfer opportunities in the Sacramento River Valley, the San Joaquin River Valley and the Sacramento-San Joaquin Delta.

Sacramento River Valley Opportunities

Sacramento River. There are about 154 individual and district water users who divert from the Sacramento River under agreements with the Bureau for CVP water. Many of these entities diverted prior to construction of Shasta Dam and Reservoir and have water rights settlement agreements with the Bureau for CVP water. There are three types of water service: (1) users with water rights defined by the State of California, (2) users with an entitlement acknowledged by the Bureau but not defined by State water rights, and (3) users with State water rights and Bureau entitlements who also receive CVP contract water. In addition, some districts receive only CVP contract water. Water users with any type of entitlement described here and who meet the four conditions identified for providing a supplemental supply to CCWD are listed in Exhibit 4-5 of the FWSS. As part of the CVPIA process, the Bureau has developed guidelines for the transfer of water rights settlement water and entitlements, jointly termed "base water," and CVP contract water. Water under State water rights would be transferred under conditions defined in the California Water Code.

Feather River. Lake Oroville, an SWP facility, develops most of the runoff of the Feather River in Butte County. The SWP also provides water to prior water rights holders who are affected by the project. The Oroville-Wyandotte Irrigation District (OWID), which has State water rights on the South Fork Feather River, Lost Creek and Slate Creek, sold water to the Drought Water Bank in 1992. OWID may be willing to enter into a water transfer agreement with CCWD.

Yuba River. Runoff of the Yuba River, from Yuba and portions of Sierra and Nevada counties, is regulated by facilities of the Yuba County Water Agency (YCWA), Pacific Gas and Electric Company (PG&E) and the Nevada Irrigation District (NID). PG&E and NID divert water from the basin into the American and Bear Rivers, respectively. OWID diverts water from Slate Creek, a tributary of the Yuba River, into the Feather River basin. YCWA has sold and transferred nearly 900,000 ac-ft in recent drought years and was able to do so because its local needs could not be fully met due to a lack of distribution facilities, which are now under construction. The California Department of Fish and Game (DFG) has requested the SWRCB to require YCWA to increase minimum flows in the Lower Yuba River. The SWRCB is currently preparing an order. If minimum flows are increased, the YCWA will lose some of its operational flexibility to transfer water. The transferable supply will also decrease as local uses increase.

American River. Water and contract rights for CVP water currently exceed the regulated supply in most years on the American River, which drains portions of Placer, El Dorado and Sacramento Counties. Instream demands on the Lower American River are large and are supplied by releases from Folsom Reservoir. East Bay Municipal Utility District (EBMUD) is permitted to divert water in high runoff situations; however, EBMUD cannot utilize its entitlement unless it diverts water from the Delta because it does not have a connection between the Folsom South Canal and the Mokelumne Aqueduct. Through arrangements with EBMUD and concurrence of the Bureau, CCWD could acquire EBMUD's unused entitlement and bank the water in a conjunctive use facility. In 1992, the Placer County Water Agency provided water for the Drought Water Bank and in future years may be willing to enter into transfer arrangements with CCWD.

The City of Sacramento has annual water rights on the Sacramento and the American Rivers for 81,800 and 245,000 ac-ft, respectively. The city's rights from the Sacramento River are appropriative; those from the American River are a combination of appropriative and contractual with the CVP. The Sacramento Municipal Utility District (SMUD) also has rights for 60,000 ac-ft on the American River. In the water rights resolutions required for the construction

C-100312

of the Folsom Dam, the Bureau entered into an agreement with the City of Sacramento that firmed up the city's rights on the American River with supply from the Folsom Reservoir. The agreement between the city and the Bureau is permanent (i.e., without expiration date). Although the city's surface water entitlements are greater than its present need, it is unlikely that the city would transfer any of its surplus entitlement to CCWD. The city has historically not been willing to serve neighboring areas within the Sacramento metropolitan area due to concerns based on the potential loss of the permanent contract status for CVP water or additional requirements that might be added to the city's contract as a result of new transfer agreements.

The concept of an Auburn Reservoir in Placer County has been intensively studied by the Bureau, U.S. Army Corps of Engineers and consulting firms for many years. Early plans by the Bureau called for a multipurpose reservoir with a capacity of over 2 million acre-feet (MAF) on the North Fork American River at the headwaters of Folsom Lake. The reservoir is environmentally controversial and costly. If the Auburn Dam and Reservoir project could overcome political, environmental and public opinion concerns, the project could provide flood control storage in addition to yielding about 200,000 ac-ft annually from currently unregulated flows.

San Joaquin River Valley Opportunities

Stanislaus River. South San Joaquin Irrigation District in San Joaquin County and Oakdale Irrigation District in Stanislaus County have joint water rights on the Stanislaus River and have agreements with the Bureau for storage in New Melones Reservoir, which replaced Melones Reservoir. These districts have sold water in recent years to the Drought Water Bank and to the DFG. Oakdale Irrigation District has entitlements greater than its current needs and is seeking parties interested in entering into transfer agreements.

Tuolumne River. Modesto Irrigation District and Turlock Irrigation District (TID), along with San Francisco Hetch Hetchy Water and Power, have water rights on the Tuolumne River in Tuolumne County. The three entities financed the construction of New Don Pedro Reservoir, which is operated jointly by these districts. The Federal Energy Regulatory Commission (FERC) is currently evaluating new requirements for instream flows for fish in the Lower Tuolumne River. The new FERC order for releases from the New Don Pedro Reservoir could affect the amount of water available for transfer by these districts. Modesto Irrigation District, located in Stanislaus County, is currently evaluating transfer potentials for a portion of its surplus entitlement. TID may not have extra water for transfer because local demands are being made on TID to supply water to the Montpelier Irrigation District.

I-4

Merced River. The Merced Irrigation District (MID), located in Merced County, distributes water stored in New Exchequer Reservoir. It also supplies water to the Stevenson Irrigation District to the west. MID also pumps wells to supplement its surface water supplies when needed. MID is considering lining some of its canal to conserve water, which could be transferred. MID is actively pursuing transfer arrangements for a portion of its surplus entitlement and, in fact, is currently negotiating a water transfer contract.

Sacramento-San Joaquin Delta Opportunities

Delta Wetlands Project. The Delta Wetlands Project involves conversion of existing islands in the Delta from agriculture to storage reservoirs. This is a private undertaking and the enterprise is looking for customers to buy water. The certainty of supply depends on water rights that could be available after exports and in-Delta use. During dry years, such supplies would likely be limited to the quantity of water now used for irrigation on the islands. With evaporation from the open water surface, it is likely that the net yield from existing rights would be limited. The assurance of supply in a drought period would require careful evaluation of the hydrology and project operations. In addition, a number of islands in the Delta offer storage opportunities similar to the concept of the Delta Wetlands Project. They would all, however, be under similar water rights constraints as the Delta Wetlands Project. The storage yield in dry years would be about equivalent to fallowing because the storage project would have junior water rights. This problem might be overcome if an island(s) is developed by CCWD and priority rights are established under the area-of-origin sections of the California Water Code. Water quality of the water released from islands is in question and of concern.

Kellogg Reservoir Project. This 135,000 ac-ft reservoir site has been previously investigated by CCWD and the Bureau and would store surplus Delta water. The diversion priority relative to SWP and Federal CVP export would need to be determined. Currently, endangered species in the Delta severely limit diversions. However, since the development of the Kellogg Reservoir would not occur in the near future, issues in the Delta may be resolved by the time it becomes a viable option.

Regional Availability of Groundwater Opportunities

California does not have a comprehensive groundwater management statute. The recently enacted Water Code Section 10753 authorizes any local agency whose service area includes a groundwater basin not under management to adopt a management plan (A.B. 3030 plan). Many areas assumed that the plan adoption would result in fewer complexities in groundwater transfers. Recent case review indicates, that even with A.B. 3030 groundwater export as a permanent supplemental source faces legal obstacles. For example, the California Court of Appeals recently held in Baldwin v. County of Tehama that A.B. 3030 did not preempt the field of groundwater management and control, and upheld the validity of a county ordinance that had the express purpose of prohibiting export of groundwater as an exercise of the county's police power.

The complexity of export increases if the source of water is an overdrafted basin (or a portion of a basin). In those cases, the export must be consistent with an approved management plan. For these reasons, export appears somewhat problematic as a potential source unless a basin with a perennial surplus can be located or a conjunctive use program can be established. Even so, details of the transaction are those that would be typical of any inter-basin transfer, including dealing with water resources; environmental, economic and social impacts in the area of origin of the water; and the potentially complex issues related to transport of the water throughout the Delta.

The following discussion provides additional detail on potential groundwater opportunities in Northern Sacramento Valley, Yuba County, Yolo County, and Eastern Contra Costa County.

Northern Sacramento Valley. Northern Sacramento Valley includes Stony Creek Fan and the Thomas Creek Fan in Glenn and Tehama counties. Stony Creek is regulated by upstream storage of the Orland Project at Stony Gorge and East Park reservoirs. Black Butte Reservoir, a large flood control reservoir facility on Stony Creek, was constructed by the U. S. Army Corps of Engineers with the water supply integrated into the CVP. Water is released from Black Butte Reservoir into the Sacramento River via Stony Creek. Downstream from Black Butte Reservoir are extensive gravel areas irrigated by water from the Federal (Bureau) Orland Project. Orland Project water users may be amenable to a project that would include financing of wells for local water with provisions for additional pumping in dry years when CCWD would need supplemental water. Because of the high porosity of the Stony Creek Fan, recharge could be accomplished relatively quickly in the years when there is surplus spring outflow. This source would probably need to be developed in stages for local acceptability and could likely grow to 20,000 ac-ft or more per year.

A similar situation exists farther to the north on Thomes Creek, which is unregulated. The Corning Water District receives CVP water from the Corning Canal, which diverts from the Sacramento River at the Red Bluff Diversion Dam. Concern regarding diversion of downstream migrating smolts in the Sacramento River has caused the Bureau to defer diversions into the canal past the spring when irrigation requirements begin. Overlying entities might be willing to provide groundwater for export if they were aided financially in developing groundwater for their early spring use and years in the future when they will be shorted in the CVP contract supplies. This supply could yield up to 20,000 ac-ft/yr.

Yuba County. There is active local interest within Yuba County to enter in to a groundwater conjunctive use export arrangement. The Ramirez and Cordua Irrigation Districts transferred water to DWR in 1994 by pumping groundwater and allowing their surface entitlements from the YCWA to flow into the Delta. Groundwater levels south of the Yuba River have been overpumped in recent years. However, with completion of the South County Canal in 1986 (by the Brophy Water District and the South Yuba Water District) groundwater levels are recovering (YCWA,

1992). The Brophy and South Yuba Water Districts participated in groundwater exchange in 1990 by foregoing their surface water entitlements from the YCWA. Similar arrangements might be made to provide water to CCWD.

Yolo County. Because groundwater levels are depressed in central Yolo County, the Yolo County Flood Control and Water Conservation District is actively seeking supplemental water. The district constructed Indian Valley Dam and Reservoir in the Cache Creek drainage for supplemental water and is evaluating political means of securing the extension of the authorized Tehama-Colusa Canal and diversions directly from Sacramento River for irrigation. During the recent drought, the district did not have adequate resources, and extensive groundwater pumping was undertaken to meet the water shortages. In the Yolo Bypass area of the County, the Conaway Ranch has proposed conjunctive use of its surface rights from the Sacramento River and groundwater for export into areas of Solano County. One of the chief concerns about moving forward with this project is land subsidence. Measuring devices have been installed in wells to evaluate this potential. The DWR has cooperated and continues to investigate the potential for groundwater banking in Yolo County.

East Contra Costa County. The City of Brentwood and East Contra Costa Irrigation District are jointly funding a Phase II groundwater study. The study is being conducted by Lawrence Livermore National Laboratory and the University of California at Davis (Davisson and Criss, 1994). As a result of the historical application of fertilizers in the area, nitrate concentrations in the groundwater are high and would require water treatment. The report found that the City of Brentwood is currently using groundwater at three times the rate of recharge. Because the majority of water recharged in the past has been from agricultural irrigation, the ongoing reduction in agricultural acreage as a result of urbanized growth will further reduce the rate of recharge.

Regional Availability of Reclamation Opportunities

Rights to reclaimed wastewater are vested in the entity that reclaims the water, unless retained by the potable water supplier by an agreement. The ability to sell water, however, is more restrictive. The obligation to continue to
-6 discharge treated effluent, if it is beneficially used by others, is not clearly established. If effluent is not discharged to surface water (i.e., not abandoned) but delivered directly to a user, it may be an acceptable practice even though another user or instream benefits are injured. Chief Counsel for the SWRCB has informally stated this position. It is generally agreed that any portion of the effluent derived from groundwater can be transferred, even if cessation causes injury.

The required level of recycled water treatment depends on the intended use. Higher levels of treatment are required for uses where human contact with recycled water is possible. Higher levels of treatment are also required to meet specific recycled water quality goals. Historical recycled water uses in California include landscape and crop irrigation, groundwater recharge, cooling towers, recreational impoundments, industrial uses and indirect potable reuse. The Department of Health Services (DOHS) has developed comprehensive wastewater recycling regulations that established treatment processes, water quality criteria and treatment reliability requirements as listed in Title 22, Division 4 of the California Administrative Code (Title 22). Title 22 regulations and direct filtration guidelines specify design criteria, operations criteria and treated water criteria required for various recycled water uses.

The Title 22 regulations are being revised; the latest version of the reclamation criteria was proposed in 1993; a revised draft released in 1994 is expected to be approved in the near future. The draft criteria differ from the existing regulations and direct filtration guidelines, shifting from design- and operations-based criteria to performance-based criteria. The draft criteria define four levels of reclaimed water treatment: undisinfected secondary, disinfected secondary-23, disinfected secondary-2.2, and disinfected tertiary.

Potential recycled water projects are qualitatively described below and identified based on recycled water end users. They include the District's current Service Area, as well as the Central Valley and San Francisco Bay Area. In general, the industrial water recycling projects have a more constant demand than urban or agricultural irrigation water recycling projects. Except where noted below, recycled water treatment facilities and distribution systems would be required to implement any of these potential projects.

Shell/Tosco Industrial Recycled Water Project. The Shell Martinez Manufacturing Complex and Tosco Refinery are northeast and north of the CCCSD Wastewater Treatment Plant, respectively. Treatment, storage and transmission facilities have been constructed to provide up to 30 mgd of recycled water from the CCCSD Wastewater Treatment Plant for use in cooling towers and heat exchangers at these two industries. Both industries currently use raw water from the Contra Costa Canal for these demands (JMM, 1990a; JMM, 1990b).

This water recycling option has not been used to date because of water quality issues. Implementation of this water recycling option would require that the CCCSD Wastewater Treatment Plant increase its level of treatment to remove ammonia and phosphate so that the existing ion exchange treatment process or, alternatively, reverse osmosis is able to meet recycled water quality requirements set by the two refineries.

USS-Posco/Dow/Gaylord Industrial Recycled Water Project. The DDSD water recycling feasibility study (JMM, 1989) identified significant industrial water users in the overlapping CCWD and DDSD service areas. These users include USS-Posco, Dow Chemical and Gaylord Container. Since the feasibility study was completed, Gaylord Container stopped operation. However, recycled water demands for a similar operation to replace Gaylord Container are assumed for the FWSS. USS-Posco and Dow Chemical are near the DDSD Wastewater Treatment Plant, which would minimize recycled water distribution costs. All industries surveyed in the feasibility study use raw water from the Contra Costa Canal for all or part of their process water needs. Some of the industries treat raw water to meet water quality requirements for certain uses. Accordingly, some level of recycled water treatment would be required to meet industrial recycled water quality goals.

Central County Urban Landscaping Recycled Water Project. A planning study was completed that evaluated irrigation uses and alternative transmission options for urban landscaping water recycling in the overlapping area served by CCWD and CCCSD. Potential recycled water customers include greenbelt irrigators, golf courses, parks, schools, homeowners' associations, individual commercial properties and office buildings. Recycled water transmission alternatives examined included new pipelines or conversion of the Diablo Valley Loop of the Contra Costa Canal from raw water to recycled water transmission (CCCSD, 1995; KLH-Bryan & Murphy, Inc., 1992).

Pittsburg/Antioch Urban Landscaping Recycled Water Project. The DDSD water recycling feasibility study also identified urban landscaping water recycling options in the overlapping CCWD and DDSD service areas. Potential recycled water customers include greenbelt irrigators (e.g., Caltrans), golf courses, parks and schools.

East County Urban Landscaping Recycled Water Project. Potential recycled water use for future urban areas in East County includes parks, schools, homeowners' associations, commercial establishments and business parks (CCWD, 1994a; JMM, 1991). Urban irrigation recycled water use for golf courses and individual commercial properties is a potential as these facilities are developed.

Pittsburg/Antioch Satellite Recycled Water Project. A recycled water option not tied to existing wastewater treatment facilities uses a small recycled water treatment plant, or satellite plant, near the point(s) of recycled water use. The advantage of a satellite plant is that it minimizes recycled water transmission costs. A satellite plant requires that a wastewater interceptor be near the demand area for this option to be feasible, and is typically located near a significant recycled water demand such as a golf course or business park. Previous studies (JMM, 1992; CDM 1992d) evaluated satellite treatment facilities for golf courses, parks and major new residential developments in the Pittsburg and Antioch areas.

East County Agricultural Recycled Water Project. Land use in this part of the county is more agricultural than in the western part of the CCWD Service Area, with residential development moving eastward. Agricultural irrigation water reuse is a potential use in this part of the county and could be conceived through two methods. First, recycled water could be applied directly to fields according to demand. Second, recycled water could be injected into the groundwater where hydrogeologically feasible and pumped according to demand. Groundwater injection acts as recycled water storage in this option. Seasonal operation of recycled water treatment facilities would be required in the first option, while a more constant operation would be required in the second option. In either case, agricultural irrigation water reuse would be substituted for current raw water use from Rock Slough or the Contra Costa Canal.

Groundwater Recharge Recycled Water Project. This type of recycled water project has not previously been evaluated within the CCWD Service Area but is being used in several locations in Southern California. In this type of project, a high level of recycled water treatment is provided, and the recycled water is injected into a groundwater aquifer. For example, Orange County Water District's Water Factory 21 provides lime clarification, filtration, Granular Activated Carbon (GAC) adsorption and disinfection to treat recycled water before injection into an aquifer to prevent seawater intrusion. A portion of the filter effluent is treated with reverse osmosis to lower the TDS concentration in the injected recycled water.

While prevention of seawater intrusion is not a critical issue in the CCWD Service Area, a groundwater recharge recycled water project could be used for indirect potable reuse in critical periods. That is, a high level of recycled water treatment, similar to Water Factory 21, would be provided; the recycled water would be injected into a groundwater aquifer and withdrawn for potable use during critical flow periods.

Recycled Water Sources in the Central Valley. There are several potential opportunities for wastewater reclamation outside the District's current Service Area. These opportunities would involve transfer arrangements similar to those needed for the transfer of surface water supplies.

Several examples of opportunities outside of Contra Costa County are described below.

City of Tracy. Tracy is currently studying reclamation of about 30,000 ac-ft of wastewater per year. With CCWD financial participation, it might be possible to provide reclaimed water to farmers in the Banta Carbona Irrigation District for irrigation. In exchange, the Banta Carbona Irrigation District would allow CCWD to take an equal amount of its entitlement from the CVP.

City of Modesto. Modesto is currently producing about 27,000 ac-ft of treated wastewater per year, which it uses to irrigate city-owned farmland. Modesto's discharge permit to the San Joaquin River requires a dilution ratio of 20:1, river water to wastewater, which severely restricts opportunities for river discharge at the present treatment level. A higher treatment level would permit discharge into the San Joaquin River and allow CCWD to pick up the recycled water at its Rock Slough facility. Because Modesto now uses the treated wastewater, transfer to CCWD would not cause third-party injury. Alternatively, if reclaimed water from Modesto is used to irrigate crops in western Stanislaus County in lieu of CVP deliveries, the CVP water could be transferred to CCWD.

Central California Regional Water Recycling Program. The Central California Regional Water Recycling Program, composed of many water and wastewater agencies around San Francisco Bay, has initiated a study of the potential of collecting up to 550,000 ac-ft of wastewater annually, treating it and delivering it to service areas with non-potable demands. The alternatives analysis will identify each potential service area, non-potable water demand, treatment level, potential applications, conveyance and storage, options for salt management, and blending and distribution facilities (CCRWR, 1995). Additional issues to be explored include the benefits and impacts to fish and wildlife ecosystems, the reduction of wastewater discharge into San Francisco Bay, and reasonable solutions to meeting the costs for treatment and conveyance facilities. Regions currently under study include: (1) the Delta-Mendota Canal Service Area; (2) the Delta Service Area, which includes environmental enhancement flows and Delta Islands irrigation options; (3) South of the Bay Service Area, which may include the Salinas Valley; (4) the Southern San Joaquin Service Area; and (5) reusing all the water locally. The feasibility of this alternative is being funded by 15 Bay Area water and wastewater agencies and the Bureau. It will be several years before the technical findings and the social issues surrounding such extensive reuse of reclaimed water would be resolved.

MOST PROMISING POTENTIAL TRANSFER SOURCES

The following surface water transfer sources were identified as the most promising based on the screening of 84 potential water transfers. These sources are immediately available for negotiating a transfer arrangement:

Surface Water Transfers from the Sacramento Valley
Oroville-Wyandotte Irrigation District, Butte County
Yuba County Water Agency, Yuba County
Sutter Mutual Water Company, Sutter County
Reclamation District 108, Colusa County
Natomas Central Mutual Water Company, Sacramento County

Surface Water Transfers from Contra Costa County
East Contra Costa Irrigation District, Contra Costa County

Delta/In-County
Various private landowners

A more detailed description of these sources is provided below. The identification of these sources does not preclude other sources. This list represents the most active sources in the water market at this time and that can meet the District's needs.

Oroville-Wyandotte Irrigation District, Butte County. The Oroville-Wyandotte Irrigation District (OWID) has water rights on the South Fork of the Feather River and on Slate Creek, a tributary of the Yuba River. OWID serves approximately 30,000 acre-feet annually to local municipal and agricultural users. OWID has provided transfer water to the California Drought Water Bank in 1991 and 1992. OWID's present annual supply exceeds its local demand. OWID may be willing to enter into water transfer arrangements for the short-term or long-term.

Deliveries to CCWD would be dependent on fish flow requirements on the Feather River below Lake Oroville and possibly on the South Fork Feather River above Lake Oroville. While an exact transfer amount is not known at this time, for the purposes of the study we will assume 50 TAF of transfer water annually.

Reclamation District 108 (RD 108), Colusa County. RD 108 has an appropriative state water right on the Sacramento River and a CVP agricultural water delivery contract in the amounts of 199 TAF and 33 TAF, respectively. RD 108 is located in Colusa County along the Sacramento River. The CVP administers both the state water rights entitlement and the CVP contract entitlement from Lake Shasta. D-9

RD 108 recently indicated an interest in entering into transfer arrangements for water in surplus of its current needs. The maximum amount and cost of transfer water available are unknown at this time.

Sutter Mutual Water Company (SMWC), Sutter County. SMWC is located in Sutter County along the Sacramento River. The SMWC has an appropriative state water right on the Sacramento River and a CVP agricultural water delivery contract in the amounts of 172 TAF and 95 TAF, respectively. The CVP administers both the state water right entitlement and the CVP contract entitlement from Lake Shasta.

SMWC's large combined entitlement makes them a likely candidate for transferring water. Additionally, their state water rights, supplied by the CVP under the Sacramento River Water Rights Settlement, is a secure supply and not subject to significant deficiencies.

Yuba County Water Agency, Yuba County. YCWA has appropriative water rights on the Yuba River which total approximately 333 TAF per year. YCWA's main facility is New Bullards Bar Reservoir. YCWA's supply currently exceeds its demand. In addition, member agencies may be willing to pump groundwater in lieu of surface water supplies.

In the past, YCWA has transferred water to other water service agencies, the California Drought Water Bank, and the Department of Fish and Game. YCWA may be willing to enter into transfer arrangements with outside agencies pending a SWRCB decision on instream flow matters.

Natomas Central Mutual Water Company, Sacramento County. The agency is actually Natomas Central MWC (NCMWC). The NCMWC has both a state water right entitlement and a CVP agricultural contract entitlement. The water right is for 98 TAF and the CVP contract is for 22 TAF. NCMWC is located on the east bank of the Sacramento River in Sacramento County. The agency serves water for agricultural, municipal and industrial uses.

C-100318

The NCMWC recently indicated a willingness to enter into transfer arrangements for water in surplus of its current need. The exact amount and cost of this transfer are unknown at this time.

East Contra Costa Irrigation District (ECCID), Contra Costa County. ECCID has a pre-1914 appropriative water right from the Delta for at least 50 TAF. CCWD currently has a transfer arrangement for up to 21 TAF annually to serve M&I needs in a small region of the service area shared among the two districts. ECCID could potentially transfer additional water to CCWD in several ways. First, ECCID and CCWD could enter into another transfer arrangement in which CCWD could serve the transferred water in its own service area. Second, if the CCWD service area of the CCWD is expanded into ECCID's existing service area, the existing transfer arrangement could be augmented, or a similar contract could be negotiated to serve M&I water in the area shared among the two districts.

WATER BANKING OPPORTUNITIES

Water banking could be an integral part of the District's Implementation Plan. The use of banking facilities could have a significant role in determining pathways and mechanisms of transferring water to CCWD. Two important concepts regarding banking are necessary to understand:

- Projects do not of themselves produce a water supply; and
- Projects provide a regulatory mechanism by which water acquired from other sources can be stored for future use.

Water banking would involve the re-regulation of a supplemental water supply to best fit the District's requirements. Re-regulation could be either seasonal, re-regulating a supply to deliver water during seasons with the least environmental and/or water supply impacts, or annual, when variable availability of a supply requires water to be stored until the need for supplemental water occurs.

-10

As part of the FWSS, a total of eight water banking opportunities were identified. Five of those opportunities are located within the San Joaquin Valley:

- Mokelumne Aquifer
- James Irrigation and Mid-Valley Water Districts
- Madera Ranch
- Semitropic Water Storage District
- Kern Fan Element

Determining the most appropriate combination of supply source and banking facility would require specific knowledge regarding the timing of releases by the transferee, demand and conveyance capacity in the Contra Costa Canal. Conveyance capacity of transfer pathways lending to a banking facility could affect the transferring of water through the Delta and exchange arrangements for taking water stored in a banking facility. Many of these considerations are not fully known, but it is important to begin understanding and addressing these issues to the greatest extent possible.

Water banking opportunities may play an important role in meeting the District's goals. There are innumerable combinations of banking opportunities and water supply sources that could be developed to meet the CCWD's future needs. A brief overview of those possible combinations is presented below.

Types of Water Banking

Water banking can be achieved through storage in a surface reservoir, a groundwater basin or a combination of the two. Each type of banking involves various efficiencies and risks of supply.

Surface Storage Banking. Any supply can potentially be banked in a surface reservoir that regulates flows and/or supplies developed by that tributary and reservoir. A foregone delivery of a surface supply can be retained in storage for either a subsequent season or annual delivery. Water banked in another agency's surface reservoir is typically relegated to be the first water lost when the reservoir spills. Accordingly, annual carryover of banked supplies involves substantial risk, particularly if the supplies are banked in reservoirs that commonly release water to either maintain flood control space or prevent spills that would bypass power houses. Risk of spillage is reduced if the volume of available storage substantially exceeds the annual natural runoff into the reservoir, such as an off-stream storage reservoir.

Accounting for water in surface storage is generally less complex and, therefore, less apt to be disputed as is accounting for groundwater banking. The retention and release of banked water from surface storage can be easily monitored and scheduled. This provides opportunities to schedule releases for periods when transit losses and environmental impact would be minimized.

Groundwater Banking. Storage in a groundwater basin involves either spreading by applying the source supply to a porous area where it percolates into the aquifer, or in-lieu storage, the delivery of surface water for consumptive uses in lieu of a groundwater supply. In contrast to surface storage, the risk of losing water banked in groundwater basins would be limited to any increased groundwater flow from the site due to banking activities.

If groundwater basins are full, developing a yield would require an initial groundwater withdrawal to create space in which to store the supply. To the extent that such a withdrawal reduces the groundwater accretion to rivers, accounting for such losses would need to be resolved with affected entities, primarily the DWR and the USBR.

Potential water banking opportunities are described in the following sections, including a discussion of the site characteristics, put-and-take methods, site status and potential advantages and disadvantages of each opportunity.

Sacramento Valley

Water banking opportunities in the Sacramento Valley are limited. Only the Sites Reservoir Project, described in the previous section, has been identified as a potential water banking opportunity in the Sacramento Valley. Groundwater banking through a conjunctive use operation has limited potential at this time in the Sacramento Valley. Groundwater basins in the Valley are generally full, with little available vacated storage capacity.

Sites Reservoir Project. Sites Reservoir is a proposed off-stream reservoir in western Colusa County. A portion of the storage capacity could be developed for banking of CVP supplies that CCWD could negotiate with other contractors.

Water storage in Sites Reservoir as part of a banking operation would be managed in the same manner as the water developed from the Sacramento River. Releases from storage would be made to meet demands from the Tehama-Colusa Canal downstream of the reservoir in-lieu of diversion at the Red Bluff Diversion Dam. Alternatively water could be released into Stone Corral Creek and the Sacramento River to be delivered directly to CCWD.

Sacramento-San Joaquin River Delta

The only water banking opportunity identified within the Delta is the proposed Delta Wetlands Project. This project, if developed, could provide a limited water banking opportunity. Because storage capacity may be limited, and therefore the storage allocation to any one participating agency, the potential banking opportunity of this project may be best utilized on a seasonal basis. Potentially high evaporation losses in the project and limited storage allocation would limit the benefits of year-to-year, long-term, water banking.

San Joaquin Valley

The San Joaquin Valley represents the greatest opportunities for water banking in the Central Valley. Identified water banking opportunities are exclusively in the form of groundwater conjunctive use projects. The development of the proposed Los Banos Grandes Project, which under the proposed operation could provide additional yields

C-100320

from the Delta and banking opportunities, has not been considered further for the FWSS. Under current conditions this project would be prohibitively expensive and the proposed yield of the project is questionable given export limitations in the Delta.

The large volume of vacated groundwater storage in areas of the San Joaquin Valley offer numerous opportunities for developing groundwater banking operations. Described below are groundwater banking opportunities that have the greatest potential of serving the needs of CCWD. Some of the projects described in this section have already been developed or are in the process of being developed. A majority of the projects that have not been developed have been intensively investigated.

Mokelumne Aquifer Conjunctive Use Project. The Mokelumne Aquifer underlies much of northern San Joaquin County. Large areas of groundwater depression have developed east of Stockton and northeast of Lodi. EBMUD's Mokelumne Aqueduct crosses this area to the south of the Mokelumne River. EBMUD has recently initiated Phase I of the Mokelumne Aquifer Recharge and Storage Project. This project would involve a groundwater storage/conjunctive use project for surplus EBMUD supplies from the Mokelumne River and also, potentially, its American River entitlement.

Site Characteristics. Historical overdraft in San Joaquin County has been estimated at 70,000 ac-ft/yr (DWR, Draft Bulletin 160-93). EBMUD's project is striving to develop a groundwater storage program with a yield of up to 50,000 ac-ft in dry years. The total vacated storage in the county is estimated at 6 million ac-ft and includes a significant groundwater depression to the east of Stockton.

EBMUD studies show that conditions in the Lower Mokelumne River basin lend themselves to artificial and in-lieu groundwater recharge. Additional surface water deliveries for in-lieu recharge could produce an estimated 108,000 ac-ft in wet years with only minor modifications to the surface water distribution systems of Woodbridge Irrigation District and North San Joaquin Water Conservation District, who serve irrigation water to the area. While in-lieu recharge is possible during the irrigation season, substantial amounts of recharge could be possible during the winter, non-irrigation season utilizing artificial recharge mechanisms.

D-12

Put-and-Take Methods. The EBMUD groundwater storage/conjunctive use project involves storing excess wet year flows from the Mokelumne River through in-lieu or artificial recharge. Phase I of EBMUD's conjunctive use project is aimed at determining which method of recharge is most appropriate. EBMUD would deliver water for recharge through release from Pardee and Camanche Reservoirs. Released water would be diverted for delivery either to artificial recharge facilities or to agricultural users for in-lieu recharge.

EBMUD also has a CVP entitlement on the American River of 150,000 ac-ft under certain wet year conditions. To utilize water at this site, an aqueduct extension to the Folsom South Canal would need to be constructed to deliver water to recharge facilities.

As a participant in this project, CCWD could negotiate a portion of EBMUD's American or Mokelumne River supply. Additionally CCWD's participation could allow additional storage and conveyance capacity in the project to utilize other sources of American River water.

Take water could be pumped from banked groundwater directly into the Mokelumne Aqueduct for delivery into the Mokelumne River in exchange for releases from Pardee and Camanche Reservoirs for other instream use. Groundwater could be pumped for agricultural needs served by Woodbridge Irrigation District and North San Joaquin Water Conservation District in exchange for water delivered into the Mokelumne Aqueduct at its headworks.

Because river supplies for Woodbridge Irrigation District, released at Camanche Reservoir, are also required as instream flows down to the Woodbridge Diversion Dam, opportunities for exchange with Woodbridge Irrigation District are limited. North San Joaquin Water Conservation District has junior rights to divert from the Mokelumne River and opportunities to exchange banked groundwater for that district's water are also limited.

Site Status. Limited amounts of in-channel recharge occur with releases by Stockton East Water District from New Hogan Reservoir on the Calaveras River. The development of the Goodwin Tunnel/Farmington Canal Project,

which diverts water from the Stanislaus River, will supply agricultural water currently pumped from the overdrafted groundwater basin in eastern San Joaquin County. Most irrigation in the area is from wells. It would be necessary to construct distribution systems to have farmers use surface water and thereby develop an in-lieu banking program.

Advantages and Disadvantages. Discussions between CCWD and EBMUD have been initiated to determine the feasibility of a joint venture for the development of a groundwater storage/conjunctive use project incorporating American River water. In addition to water obtained from EBMUD in a negotiated joint venture project, CCWD could purchase other water on the American River. At this time, however, only Placer County Water Agency has been identified as a potential source on the American River.

James Irrigation District and Mid-Valley Water District Conjunctive Use Project. James Irrigation District (JID) and Mid-Valley Water District (M-VWD) are located in Fresno County about 15 miles west of the City of Fresno. Both districts are located on the San Joaquin Valley floor along and northeast of Fresno Slough, which connects with the San Joaquin River at Mendota Pool. The area is mainly used for agriculture and is lightly populated.

Site Characteristics. Declines in groundwater levels over a wide area, centered under Raisin City Water District to the southeast of JID and M-VWD, are among the most notable in the San Joaquin Valley. Within JID, groundwater levels have declined on the order of 110 feet over the past 30 years. Based on contours of equal groundwater elevation available from the DWR for Spring 1987, the reduced groundwater storage over the entire area exceeded one million ac-ft at that time. A limited review of available JID pumping records suggests that the vacant aquifer storage should be significantly larger after the last five years of drought pumping. In JID alone, for example, the average annual pumping from 1975 to 1986 was 16,000 ac-ft/yr, and from 1987 to 1992 the average pumping exceeded 46,000 ac-ft/yr.

JID has the ability to pump groundwater in excess of 60,000 ac-ft/yr, although its recent average groundwater supply has been closer to 20,000 ac-ft/yr. If banked groundwater were in place, it would appear that JID would have facilities (wells, pumps, canal conveyance) to produce and deliver groundwater to irrigators in place of and for delivery through Fresno Slough and/or the Fresno Slough By-Pass to Mendota Pool where it could be exchanged with water from the Delta for the San Joaquin River Exchangers.

D-13

The adjacent Mid-Valley Water District was formed in the 1980s and relies exclusively on groundwater pumpage. This district was created with plans of developing a surface water supply source and installing a distribution system. With construction of a distribution system, M-VWD could absorb surface water deliveries in wetter years for in-lieu recharge at times when JID facilities were used to the maximum extent for local water supply. New extraction facilities would also need to be constructed. Alternatively, it is possible that recharge in M-VWD would be extracted using JID facilities.

Put and Take. Water would be delivered to the Mendota Pool through USBR facilities. The Mendota Pool connects to Fresno Slough to the south, where water can be diverted by JID for its use. In the take phase, JID would need to pump additional groundwater and return it directly or exchange it for other water available to JID for delivery into Fresno Slough. This water, in turn, would be available for diversion from Mendota Pool by CVP Exchangers and a like amount of water would be available in the Delta for delivery to the Contra Costa Canal.

Recent amounts of groundwater pumping by JID indicate that there is probably sufficient pumping capacity so that new facilities would not be required for take operations.

Site Status. Aside from initial planning efforts, the groundwater basin remains essentially unmanaged and subject to continued overdraft, exacerbated by drought conditions when groundwater is further mined to replace curtailed surface supplies. As a result, in terms of potential groundwater banking, there is significant vacant storage space, and large-scale facilities are in place for pumping and delivery of groundwater. Further, since local agencies, such as JID, are well aware of declining groundwater levels and the resultant need to change pumps and motors to maintain pumping capacity, some receptivity to a banking arrangement should be expected, if it on average increases groundwater storage and decreases lifts required for local pumpers.

C-100322

Advantages and Disadvantages. The principal advantage of this operation would be that all the principal facilities are already constructed. Water banked at this project could be acquired either from CVP Exchangers and the Mendota Pool or from transfers negotiated in the Sacramento Valley. Sacramento Valley water could be delivered to the Mendota Pool through USBR facilities.

Madera Ranch. Madera Ranch is a 13,600-acre, privately owned area in southwestern Madera County, about ten miles southwest of Madera and seven miles north of the San Joaquin River. The owner is actively attempting to implement banking services and would form a public district for contracting to provide groundwater banking.

Site Characteristics. Madera Ranch includes land in the Madera Irrigation District and receives water for irrigation of approximately 1,500 acres. A portion of the ranch is also located in the Gravelly Ford Water District, which delivers water from water rights on the San Joaquin River during years of sufficient flow past Millerton Dam and from the Friant Division of CVP when there is sufficient Class II water. About 1,000 acres of Madera Ranch are irrigated with groundwater. The majority of the land is dry-farmed. The lack of irrigation development has primarily been a matter of farm management preferences of previous owners (horse breeders). Most of the land surrounding the ranch is developed, some on surface water, some on groundwater. The existing pumping hole is attributable largely to pumping in adjacent areas.

Preliminary studies have been conducted for Western Hill Water District (WHWD) to determine the feasibility of constructing recharge basins and extracting groundwater. The operational concept would involve taking water from Mendota Pool during seasons when there is excess capacity in the Delta-Mendota Canal, pumping it to the site, and artificially recharging the basin. Because there is a thin, underlying layer of hardpan over much of the site, it is contemplated that it would be developed by constructing recharge basins with topsoil and hardpan stockpiled and leveled between the basins. This would provide wildlife habitat and reduce difficulties in achieving mitigation.

Previous studies indicate that, depending on the mode of operation, up to 350,000 ac-ft of water could be stored above the Corcoran Clay. These preliminary findings require further study for verification.

I-14

Put-and-Take Methods. Water purchased for put into this project and routed through the Delta could be conveyed to the Mendota Pool through the California Aqueduct to O'Neill Forebay, where it will be released into the Delta-Mendota Canal for conveyance to Mendota Pool. Purchased water could also be conveyed from the Delta through the Delta-Mendota Canal to the Mendota Pool. Alternatively water purchased from CVP Exchangers would need only to be conveyed to Madera Ranch from the Mendota Pool, where it is delivered by the CVP for the Exchangers. A 14-mile canal would be required to convey water from the Mendota Pool to recharge areas on Madera Ranch. Some exchange arrangements might be necessary, depending on the source of supply.

Take water would be pumped from groundwater and returned to the Mendota Pool by the same canal used for put water. The take water would be exchanged with CVP water users at the Mendota Pool. CCWD would take an equivalent amount of the exchange water from the Delta through the Contra Costa Canal.

Site Status. Land uses on Madera Ranch currently consist of dryland and irrigated agriculture and natural vegetation. A reconnaissance-level study has recently been completed for groundwater banking on Madera Ranch. Implementation time could be as short as three years, if all aspects are vigorously undertaken.

Advantages and Disadvantages. Groundwater pumpers adjacent to Madera Ranch have expressed supportive interest. The California Department of Fish and Game (DFG) is in need of storage in the general area for CVP supplies to be provided under the CVPIA. DFG has expressed interest in participating in Madera Ranch groundwater development.

New facilities to put and take water would be required. Preliminary estimates indicate the costs would be around $42 million for facilities to put or take about 50,000 ac-ft per year.

Storage service would not compete with other prior water services, such as with CVP, SWP, or many areas served by these projects. Participants could negotiate their own share of a new project.

Semitropic Water Storage District. The Semitropic Water Storage District (SWSD) is a SWP contractor in northwestern Kern County. Lands are irrigated with SWP water and groundwater.

Site Characteristics. In excess of two million ac-ft of groundwater storage is available in the SWSD. Extensive in-lieu recharge capability and extraction facilities exist in SWSD. SWSD currently engages in water banking activities with Metropolitan Water District of Southern California (MWD). In-lieu recharge occurs when SWSD irrigates with surplus MWD SWP entitlement in lieu of pumping groundwater. In dry years, SWSD will pump groundwater and allow MWD to take SWSD's SWP entitlement. In addition, facilities have been constructed and are being enlarged to convey SWSD groundwater to the California Aqueduct. Local groundwater quality meets present DWR criteria to be returned to the California Aqueduct. Arsenic levels in the area may be a problem if criteria under Title 22 become more restrictive.

Put-and-Take Methods. Water could be put into and retrieved from storage in a manner similar to the way SWSD operates with MWD. In wet years, SWSD would import surplus water purchased by CCWD. The water could be conveyed to SWSD through the California Aqueduct. CCWD's purchased surplus water would be used for irrigation, thus reducing groundwater pumping by an equivalent amount, or banked by direct recharge.

In dry years, water would be returned by allowing CCWD to divert a portion of SWSD's SWP entitlement through the Contra Costa Canal. Recent agreements between the California Department of Water Resources and the State Water contractors provide that all contractors will share equally as a percent of their annual entitlement during water shortages. This agreement enhances the opportunity for SWSD to return take water through sharing its entitlement supply. An alternative take method would entail SWSD returning banked groundwater to the California Aqueduct. CCWD could exchange this water with a SWP contractor downstream of SWSD and take that contractor's SWP entitlement through the Contra Costa Canal.

Site Status. SWSD is actively engaged in a groundwater banking program with MWD. SWSD is also under consideration by DWR as a banking site for unscheduled surplus SWP water supplies. The concepts have been thoroughly studied, and new facilities are currently under construction to allow banked groundwater to be returned to the California Aqueduct. To bank water in the SWSD, agreements would have to be reached with SWSD and DWR. Implementation time could be short, as much of the required environmental studies and facility construction have already begun. The primary constraint would be approvals for through-Delta transfers.

D-15

Advantages and Disadvantages. SWSD is currently in the banking business and has developed criteria for services and costs. SWSD offers four alternative financial programs for participation.

SWSD is offering up to 1,000,000 ac-ft of storage of which MWD has contracted for 350,000 ac-ft or 35 percent. The share of storage applies to the right to share in the pumpback capacity. Pumping banked groundwater back to the California Aqueduct for an exchange at the Delta may be limited under future water quality criteria.

Kern Fan Element. The Kern Fan Element (KFE) was planned to be a direct recharge element of the SWP's Kern Water Bank program. The KFE comprises about 20,000 acres located about ten miles southwest of Bakersfield. DWR development plans for the KFE were delayed and the site is largely unused at present. In December 1994 DWR agreed to sell its interest to the State Ag Contractors.

Site Characteristics. The 20,000 acres contained in the KFE were purchased by DWR from Tenneco West, Inc. in August 1988. The site has been studied by DWR since 1986 for use as a direct recharge and extraction area. The site contains lands lying on the Kern River alluvial fan, which vary from relatively coarse (generally in the east) to clayey (in the west). The KFE generally straddles the Kern River and partially surrounds the City of Bakersfield's 2,800-acre recharge site.

The KFE overlies part of the Kern County Groundwater basin. The amount of storage space at the site was estimated to be 1.3 million ac-ft by DWR in 1987, and the amount of empty storage space in the vicinity was estimated to be 4.7 million ac-ft by DWR in 1981. Although the KFE has historically been considered to be at least partially

C-100324

underlain by the Corcoran Clay layer, recent DWR exploration has not identified the presence of the Corcoran Clay or other continuous clay layers that would create separate aquifers.

Put-and-Take Methods. The most cost-effective means to put water into the KFE is through use of the locally owned Cross Valley Canal, which delivers water to Bakersfield from the California Aqueduct near Tupman at the western boundary of the KFE. Water could be delivered from the Delta to Tupman through the California Aqueduct and then to the Cross Valley Canal for delivery into the existing City of Bakersfield 2,800-acre site or into proposed Kern County Water Agency and DWR surface recharge facilities at the site. Because capacity in the Cross Valley Canal may not be adequate to supply all prospective uses, DWR considered building a second canal for recharge supply, which would generally parallel the Cross Valley Canal.

The least expensive means to take water from the KFE would be reliance on existing extraction facilities at the site and collection into the Cross Valley Canal. The amount of extraction from local facilities is limited both by well capacities and by Cross Valley Canal operations. If extractions occur during periods of California Aqueduct deliveries to the Cross Valley Canal, then the extractions would provide water supplies in the California Aqueduct by exchange. Because California Aqueduct deliveries to the Cross Valley Canal have been limited during dry years, when "takes" would occur, the Cross Valley Canal has also been operated in reverse to physically convey water from the KFE westward to the California Aqueduct. The "take" capacity of existing facilities is limited in dry years by the relatively limited reverse flow capacity of the Cross Valley Canal. Water delivered into the California Aqueduct could replace water pumped at the Delta Pumping Plant, which would otherwise be delivered to SWP contractors downstream of the Cross Valley Canal turnout. An equal amount of water would then be diverted into the Contra Costa Canal for use by CCWD.

Site Status. DWR planning has continued after the site was purchased in 1988 with exploration, monitoring network development, groundwater model development, environmental studies and other studies. In 1990, DWR modified its planning studies to pursue phased development, with an initial 350,000 ac-ft storage phase to be followed by the
D-16 ultimate 1 million ac-ft storage project. A feasibility report and draft environmental impact statement were completed in December 1990.

At the time of purchase by DWR in 1988, the majority of the land on the site was irrigated and DWR provided for a five-year phased elimination of irrigated agriculture on the site. In 1991, DWR bought out the remaining irrigation leases and its lessees ceased irrigation. In 1991, DWR also began construction of extraction facilities as part of the La Hacienda, Inc. groundwater purchase, a related groundwater storage project. At the time of constructing extraction facilities, DWR encountered significant environmental impacts resulting from endangered species encroachment onto the KFE site. The presence of endangered species at the site delayed development of the first stage of the project while a habitat conservation plan was prepared. A draft habitat conservation plan was prepared for DWR in early 1993, but implementation of the plan is being delayed by U.S. Fish and Wildlife Service concerns about Delta impacts of KFE recharge on other endangered species. DWR plans for implementation of the KFE have been uncertain, and study funds were cut in early 1993 due to release of the draft D-1630. Implementation may depend on acquisition of State interests by the Ag Contractors.

Currently, recharge facilities that supply the KFE exist in the City of Bakersfield's 2,800-acre site. Extraction facilities also exist, both on the KFE site itself (owned by both DWR and Kern County Water Agency) and in adjacent areas (owned by Kern County Water Agency).

Advantages and Disadvantages. The advantages of the KFE are that it has a relatively large storage capacity and could be implemented without construction of additional facilities. Another possible advantage of the KFE is that it has been reviewed extensively, so that institutional difficulties with groundwater banking programs are somewhat clear. DWR and/or State Ag Contractors plans for use of the KFE are uncertain, and the project site may be available for an extended period of time.

A disadvantage of the KFE is that the availability of capacity in the Cross Valley Canal, which would be necessary for both puts and takes, is unclear. Additionally, the availability of recharge capacity in the KFE is also uncertain, as

local Kern County interests, Kern County Water Agency and DWR would all have prior recharge rights. Extraction capability in the KFE, besides being limited by Cross Valley Canal capacity, could also be restricted by neighboring water districts, which have organized as the Kern River Fan Group and protested several groundwater banking programs. Finally, environmental problems encountered by DWR (limited groundwater contamination and endangered species issues) could affect banking operations.

The conveyance capacity concerns described above could be addressed either through buying capacity in the Cross Valley Canal from a local participant agency or constructing additional facilities. Recharge and extraction facility capacity concerns might also be resolved through construction of additional facilities in the KFE that would be available for local use when not needed by CCWD.

Contra Costa County

The potential for developing water banking projects is somewhat limited within Contra Costa County. Areas of potential groundwater storage include the Ygnacio, Clayton and Pittsburg/Antioch areas. The volume of vacated groundwater storage space in these areas is not completely known. Neither the vacated nor total storage area in the Pittsburg/Antioch area is known. Total storage in the Ygnacio area is estimated to be between 30,000 to 40,000 ac-ft and 15,000 to 20,000 ac-ft in the Clayton area. Groundwater conditions in the east county area are currently the subject of study by Lawrence Livermore and the University of California at Davis. This study is being sponsored by the City of Brentwood and East Contra Costa Irrigation District.

The potential for water banking in surface storage facilities is limited at this time. The Los Vaqueros Reservoir Project, under the present operating configuration, does not provide for long-term storage of surplus water other than for emergency purposes. Some seasonal storage is allowed in the reservoir for water quality blending in the summer period. A potential surface storage banking project would involve the development of the Kellogg Reservoir Project.

The Kellogg Project would be located immediately below the Los Vaqueros Reservoir on Kellogg Creek. The reservoir was originally proposed with a storage capacity of 100,000 ac-ft. If the project were developed as a banking operation, the storage volume could be reduced. Alternatively CCWD could solicit participation by other local Bay Area agencies in developing the project and maintain is original storage volume.

D-17

The conveyance of put and take water for the Kellogg Reservoir could be accomplished through the same system being developed for the Los Vaqueros Reservoir. An obvious advantage of developing the Kellogg Reservoir Project as a water banking operation is that it would be under the direct control of CCWD. Conveyance facilities are existing or planned under the Los Vaqueros Project.

MOST PROMISING BANKING OPPORTUNITIES

Any water transfer greater than 40 to 50 TAF should also include a storage component to increase flexibility of delivery schedules. A storage mechanism would benefit smaller water transfers by increasing seasonal flexibility, or by capturing surplus flow during wet years to augment supplemental supplies during a drought. Water banking opportunities have a potentially significant role in future solutions. Storage responds well to issues of flexibility, timing, uncertainty and sensitivity to assumptions with the ability to respond to various demand and supply scenarios. The District is considering two types of banking:

- Surface Storage
- Groundwater Storage

Groundwater storage provides the most potential at this time due to existing viability of options and lower cost, as opposed to a new surface storage project. The District could implement water transfers in all years and deliver the volume in excess of their normal year supplemental needs to a groundwater bank. This would increase reliability of supplies by storing water transferred from other sources every year (when the water is available) for later use during

dry years (when water is less available and more costly). The following storage opportunities were identified as the most promising:

- Madera Ranch, Madera County
- Semitropic Water Storage District, Kern County

DESALINATION

The desalination component was configured to make effective use of the District's existing water diversion right for 26,000 ac-ft/year from the San Joaquin River, currently being taken at Mallard Slough. Over the past 26 years, the average annual diversion has only been 6,510 ac-ft, with a maximum diversion of 18,870 ac-ft in 1983. Diversions were under 500 ac-ft in seven years during the 10-year period ending in 1993. Diversions from Mallard Slough are typically made when the chloride concentration is less than 100 milligrams per liter (mg/L). A desalination plant would allow CCWD to divert water during periods of high salinity, thereby taking advantage of existing water rights at Mallard Slough.

Desalination options for the District have been reviewed and are now limited to those available within Contra Costa County only. The earlier concept of transferring water in coordination with the implementation of desalination facilities in other counties has been dismissed for reasons of local acceptability and cost.

Desalination could be used as a potential source for either a "firm" or emergency supply as one component of an overall water supply plan. This Technical Appendix discusses the potential desalination alternatives, including the water supply sources, treatment facilities, waste concentrate (brine) disposal and conveyance facilities required for each alternative.

Potential Desalination Alternatives

Desalination plants could be constructed at several locations within the District's system using several alternative water supply sources. The supply sources analyzed in this Study include:

- Mallard Slough
- San Joaquin River near Antioch
- Sacramento River near Martinez

Each of these alternatives would make use of the District's existing Mallard Slough water rights, with an amended point of diversion where required. The Mallard Slough diversions are not subject to Delta regulatory restrictions because the existing diversion point is outside the statutory Delta boundaries. Relocation of the diversion point within the statutory Delta boundary (e.g., to the San Joaquin River near Antioch) should be reviewed carefully, and may not be feasible if unacceptable additional restrictions are placed on the water rights.

One desalination alternative involves an exchange agreement with Santa Barbara. Under this alternative, the District could enter into an agreement for Santa Barbara to use available capacity in its existing desalination plant to meet a portion of its water demands. In exchange, the District would divert a portion of Santa Barbara's SWP entitlement from the Delta at its existing Rock Slough or future Old River intake. The conveyance facilities required for this alternative are similar to those for other surface water transfer opportunities, and are not considered here.

Desalination Facility Requirements

This section discusses the general requirements for implementation of a desalination alternative. Specific requirements for each alternative are described in the section "Desalination Alternatives."

Mallard Slough Water Rights. CCWD purchased the California Water Service Company in 1961 and acquired its right to divert water from Suisun Bay at Mallard Slough. Water rights permits issued by the California SWRCB in 1971 and 1983 allow the District to divert up to 26,780 ac-ft/yr from Mallard Slough. Currently, Mallard Slough water is diverted for use only at the Bollman Plant.

The 1971 permit allows for diversion of municipal and industrial waters from Suisun Bay under the following conditions:

- Direct diversion of 39.3 cfs to be diverted from January 1 to December 31 of each year.
- Annual storage of 3,780 ac-ft to be collected from January 1 to December 31 of each year.
- The total amount of water to be taken from the source (direct diversion plus collection to storage) shall not exceed 14,480 ac-ft per calendar year.
- The total amount of water to be placed to beneficial use shall not exceed 13,690 ac-ft per calendar year.

In 1983, the SWRCB issued a second permit to the District. This permit allows for the diversion of additional water from Mallard Slough under the following conditions:

- The diversion shall not exceed 39.3 cfs to be diverted from August 1 to December 31 of each year.
- The maximum amount diverted under this permit shall not exceed 11,900 ac-ft/yr.

The two permits allow a total maximum diversion from Mallard Slough of 26,780 ac-ft/yr, with a maximum amount of water placed to beneficial use of 25,590 ac-ft/yr.

River Intake. Each alternative will require a river intake to divert water from the river to the desalination plant. The existing river intake at Mallard Slough was constructed in 1929 and has a pumping capacity of 38.7 cfs. The structure does not meet current the current guidelines (California DFG and National Marine Fisheries Service [NMFS]) for design of fish screens. Relocation of the diversion point to another location on the river would require construction of a new intake structure with fish screens and ancillary equipment designed to meet current standards and guidelines.

Water Quality at Proposed Supply Sources. Water quality at the proposed intake locations experiences seasonal and cyclic variations related to the amount of fresh water runoff from the Sacramento and San Joaquin rivers. Projections of reverse osmosis system performance have been based on limited water quality data from the Interagency Delta Health Aspects Monitoring Program report "The Delta as a Source of Drinking Water, Monitoring Results, 1983 to 1987," projections of future water quality from the Los Vaqueros Stage II EIR/EIS and preliminary modeling results for the Bay-Delta standards process.

Based on the water quality data noted above, the TDS levels at the Mallard Slough intake can be expected to range from as low as 100 mg/L to over 8,000 mg/L, with typical values ranging from 2,000 to 5,000 mg/L. TDS levels at the proposed Antioch intake can be expected to range from as low as 100 mg/L to over 5,000 mg/L, with typical values between 150 to 250 mg/L during many years and between 1,500 to 2,500 mg/L in drier years. TDS levels at the proposed Martinez intake can be expected to range from as low as 3,000 mg/L to over 19,000 mg/L, with typical values between 3,000 to 4,000 mg/L during many years and between 12,000 to 14,000 mg/L in drier years.

Desalination Process Selection. Desalination is a water treatment process used to remove salt and other dissolved minerals from water. Other contaminants in the water, such as dissolved metals, microorganisms and organics, also may be removed by some desalination processes. Desalination processes can be used for either brackish water or seawater, and may be categorized as thermal or non-thermal. Waters having a TDS content from 500 mg/L to 10,000 mg/L are generally considered brackish water. Waters with TDS concentrations from 10,000 mg/L to 50,000 mg/L are typically categorized as seawater. Standard seawater, as defined by the American Society of Testing and Materials (ASTM) contains 36,000 mg/L of TDS.

C-100328

Thermal, or phase change, desalination processes require that water changes from a liquid phase to either a vapor phase (distillation) or a solid phase (freeze desalination) and then back to a liquid phase. Thermal processes include Multiple-Effect Distillation (MED), Multi-Stage Flash (MSF) Evaporation and Vapor Compression (VC) Desalination. Non-thermal desalination processes include the membrane processes of reverse osmosis (RO), and electrodialysis or electrodialysis removal (ED/EDR). Ion exchange (IX) is another non-thermal process.

Selection of the preferred process for a particular application depends primarily on water quality, but also requires consideration of operating conditions, power costs and waste brine disposal requirements. RO is the most feasible process for desalination of brackish water at the proposed intake sites. Distillation is not economically competitive with RO for these TDS levels. ED/EDR is potentially feasible, but the anticipated TDS levels are near the upper limit of the process capabilities and are often above the generally accepted range for economical operation of an ED/EDR facility. Ion exchange is not suited for large-scale removal of salts, and salinity levels in Delta water often exceed the upper limit for economical operation of an ion exchange facility.

For the purposes of this analysis, the desalination alternatives have been formulated based on an RO process.

Reverse Osmosis Desalination. RO is a non-thermal, membrane desalination process which is a variation of the natural process called osmosis. The process of osmosis occurs when "pure" water and salty water are separated by a semi-permeable membrane that allows water to pass through but rejects the chemical ions. Water from the pure solution will diffuse through the membrane until the salt concentrations on both sides of the membrane are equal. As the liquid flows from the pure to the salt water side of the membrane, the hydrostatic head on the salt water side increases. This flow from the dilute to the concentrated side continues until the hydrostatic head on the concentrated side equals the "osmotic pressure" of the "salt water." In RO, pressure greater than the osmotic pressure is applied to the saline feedwater which forces "pure" water to diffuse from the salt water side to the "pure" side of the membrane. The pure water recovered by the RO process is called permeate, or product water. A more salty waste concentrate is left behind on the salt water side of the membrane. This concentrate is sometimes referred to as "brine" or "reject." Disposal of waste concentrate from RO plants can pose a significant economic and environmental problem.

Desalination Alternatives

The treatment and conveyance facilities for each of the proposed desalination alternatives are described below.

Mallard Slough Alternative. This alternative would consist of a desalination plant using water from the District's existing Mallard Slough intake as a source of supply. Three sub-alternatives are described below.

Alternative M1. This alternative consists of a desalination facility at Bollman WTP site serving the Treated Water Service Area (TWSA) customers. This alternative would use the existing Mallard Slough intake and raw water pipeline to Bollman. A separate treatment train would be constructed at the Bollman site with a 25 mgd pretreatment facility (consisting of a conventional plant with rapid mix, flocculation, sedimentation and filtration) and a 20 mgd (product water capacity) RO facility. The product water would be piped to the clearwell and mixed with the Bollman effluent for pumping into the TWSA distribution system. Waste concentrate (brine) would be treated and returned to the product water stream with land disposal of a crystalline solid waste.

Alternative M2. This alternative consists of a desalination facility at (or near) the Mallard Slough intake site serving TWSA customers. This alternative would use the existing Mallard Slough intake structure with the pumps modified to pump directly into a 25 mgd conventional pretreatment plant. A 20 mgd (product water capacity) RO facility would be adjacent to the pretreatment plant. The product water would be pumped in the existing 36/33-inch line to the Bollman site, requiring about 5,000 feet of new pipe to reach the clearwell. The RO permeate would be mixed with the Bollman effluent for pumping into the TWSA distribution system. Waste concentrate (brine) would be treated and returned to the product water stream with land disposal of a crystalline solid waste.

Alternative M3. This alternative consists of a desalination facility at (or near) the Mallard Slough intake site serving the District customer cities of Bay Point, Pittsburg, and Antioch. This alternative would use the existing Mallard Slough intake structure with the pumps modified to pump directly into a 25 mgd conventional pretreatment plant. A

20 mgd (product water capacity) RO facility would be adjacent to the pretreatment plant. The product water would be pumped to the water treatment plants in Bay Point, Pittsburg, and Antioch for high lift pumping into each distribution system. Waste concentrate (brine) would be treated and returned to the product water stream with land disposal of a crystalline solid waste.

San Joaquin River at Antioch Alternative. This alternative would consist of a desalination plant using water from a new intake located on the San Joaquin River near Antioch. Three sub-alternatives are described below.

Alternative A1. This alternative consists of a desalination facility at Bollman WTP site serving TWSA customers. This alternative would use a new Antioch intake and raw water pipeline connecting to the existing 36/33-inch raw water line at Mallard Slough, which would convey the water to Bollman. A separate treatment train would be constructed at the Bollman site with a 25 mgd pretreatment facility (consisting of a conventional plant with rapid mix, flocculation, sedimentation and filtration) and a 20 mgd (product water capacity) RO facility. The product water would be piped to the clearwell and mixed with the Bollman effluent for pumping into the TWSA distribution system. Waste concentrate (brine) would be treated and returned to the product water stream with land disposal of a crystalline solid waste.

Alternative A2. This alternative consists of a desalination facility at (or near) the new Antioch intake site serving TWSA customers. This alternative would use a new Antioch intake and low lift pumps to pump directly into a 25 mgd conventional pretreatment plant. A 20 mgd (product water capacity) RO facility would be adjacent to the pretreatment plant. The product water would be pumped through a new 30-inch pipeline connecting to the existing 36/33-inch line at Mallard Slough and on to the Bollman clearwell. The RO permeate would be mixed with the Bollman effluent for pumping into the TWSA distribution system. Waste concentrate (brine) would be treated and returned to the product water stream with land disposal of a crystalline solid waste.

Alternative A3. This alternative consists of a desalination facility at (or near) the new Antioch intake site serving the District customer cities of Pittsburg, and Antioch. This alternative would use a new Antioch intake and low lift pumps to pump directly into a 25 mgd conventional pretreatment plant. A 20 mgd (product water capacity) RO facility would be adjacent to the pretreatment plant. The product water would be pumped to the water treatment plants in Pittsburg and Antioch for high lift pumping into each distribution system. Waste concentrate (brine) would be treated and returned to the product water stream with land disposal of a crystalline solid waste.

D-21

Sacramento River at Martinez Intake Alternative. After a cursory review, the Martinez intake alternative was eliminated from consideration. The salinity level at Martinez is significantly higher than at Mallard Slough. This would result in higher capital and O&M costs for the plant, with no readily identifiable advantages. The Martinez intake alternative was dropped from further consideration.

C-100330

Technical Appendix E: Environmental Considerations of Transfer Pathways

SUMMARY

As described in the FWSS chapters, environmental considerations are a driving factor behind potential future reductions in allotments to CVP contractors, particularly sufficient streamflow for fishery resources. As part of the FWSS, three Environmental evaluation criteria were developed to screen potential Resource Alternatives (see TA-B). During the screening phase of Round 1 Resource Alternative strategies, however, it became apparent that although important, the Environmental evaluation criteria did not necessarily distinguish between potential Resource Alternatives. Therefore, no Environmental criteria were carried forward into the Round 2 screening process as key criteria in the context of the FWSS. As the FWSS chapters do not cover in detail the issues associated with potential environmental impacts to aquatic, terrestrial and fishery resources, the purpose of this Technical Appendix (TA) is to document the District's evaluation of environmental effects of potential water transfers that may be undertaken between CCWD and various water suppliers.

DEFINITION OF TRANSFER ALTERNATIVES

Surface water transfers are being considered as one alternative to meet the District's future water needs. As part of the Study, the District identified six of the most promising transfer sources, prioritized as opportunities to pursue:

- Oroville-Wyandotte Irrigation District
- Yuba County Water Agency
- Sutter Mutual Water Company
- Reclamation District 108
- Natomas Central Mutual Water Company
- East County/Delta Sources (e.g., Byron-Bethany Irrigation District and East Contra Costa Irrigation District, and other private landowners)

E-1

The transfer market, driven by supply and demand, is constantly changing. These recommendations are based on today's environment; six months from now this list could change. Other sources should continue to be examined and revisited during future updates of the FWSS. Specific water transfer candidates will be pursued after selection of the Preferred Alternative and establishment of an implementation strategy and timeline.

The objective of this Technical Appendix is to describe the constraints and opportunities related to each of the identified "most promising" transfer sources to distinguish between different classes of transfer types based on potential environmental impacts, and to identify time periods when transfers have the least potential environmental impact or greatest potential environmental benefit. This Technical Appendix covers other identified potential sources in addition to these most promising sources (e.g., East Bay Municipal Utility District, Reclamation District 2068, Modesto Irrigation District, and others), as well as groundwater and reclamation export, should working with those sources become more likely in the future.

Most of the transfers are assumed to involve a maximum of 50,000 ac-ft of water for this evaluation. The delivery schedule will be constrained by the CCWD demand schedule and transfer from a particular source can be made only during the period in which the source agency typically receives its supply. The demand schedule at the 2020 level for Service Area Alternative C is approximated in Exhibit E-1.

C-100331

To the extent practicable, transfers will be made during periods which produce the greatest environmental benefit. The flexibility of transferring water within periods or at rates that provide optimal environmental benefit will be limited by several factors. First is the demand of CCWD. CCWD currently, and presumably in the future, will divert water from the Delta to match its demand. Therefore transfers cannot be made at rates that exceed CCWD demand during the transfer period. The demand schedule at the 2020 level for Service Area C is approximated below.

Secondly, transfer from particular sources can be made only during the period in which the source agency typically receives its supply. For example, an irrigation district typically receives its water supply during the months of April through October; therefore, transfers would be made during the same period.

Exhibit E-1
Estimated Demand Schedule for CCWD Service Area Alternative C
Water Year 2020

Month	Cubic-Feet Per Second	Acre-Feet
October	300	18,720
November	220	12,970
December	210	13,120
January	190	11,800
February	200	10,950
March	130	7,700
April	280	16,640
May	300	18,360
June	410	24,240
July	430	26,280
August	430	26,380
September	380	22,840
TOTAL		210,000

E-2

ENVIRONMENTAL EVALUATION

The focus of the environmental evaluation presented in this Technical Appendix is to describe both benefits and adverse impacts related to potential transfer sources. For each potential source, existing resources are described, as well as fishery management issues and potential impacts. Potential sources include the Sacramento Valley, San Joaquin Valley, and Contra Costa County, evaluating surface water, groundwater and reclamation exports. This section also begins with an Overview of both aquatic and terrestrial resources.

OVERVIEW

This Overview describes key issues associated with aquatic and terrestrial resources, including both Delta and upstream impacts.

Aquatic Resources

Delta Impacts. Surface water transfer alternatives share one important feature: they all require increased diversions from the Delta by CCWD. Increased pumping from the Delta will involve environmental conflicts and will face greater opposition from regulatory agencies and environmental groups than other water supply sources under con-

sideration, such as reclamation and conservation. Cumulative impacts from increased Delta pumping have been cited by the U.S. Fish and Wildlife Service (USFWS) as justification for recommending denial of water transfers.

Three factors may mitigate the impact of increased diversions by CCWD and enhance the District's ability to negotiate a transfer. First, it is assumed that CCWD will rely increasingly on its new Los Vaqueros pumping facility on Old River. The intake pumping plant will incorporate fish protection facilities meeting CDFG criteria for fish screens in upland waters. Second, the Rock Slough intake will be screened in accordance with the Central Valley Project Improvement Act (CVPIA). Finally, transfers may reduce existing impacts, or enhance fishery habitat at diversions downstream of the transfer source. Some transfer alternatives may involve a reduction in export pumping at either the SWP pumps (Berrenda Mesa Water District and Byron Bethany Irrigation District) or the Central Valley Project pumps (CVP exchange contractors). Since the SWP has higher losses of many important and/or sensitive fish species than the CVP, transfers involving a reduction in SWP pumping may be preferred environmentally.

In general, pumping from the Delta has the greatest potential impact in the April through June period when sensitive species are present in greatest abundance. CCWD would take 28% of its water during this period (Exhibit E-1). The period of lowest potential impact would be through August and September.

Upstream Impacts. Water transfers may affect fisheries through changes in river flows, reservoir carryover storage, or fish losses in diversions. Impacts on upstream fish populations or fish habitat could be adverse or beneficial depending on details resulting from negotiation of the transfer and the current status of water to be transferred. It is assumed that some transfer sources are willing to make water transfers because they do not currently use a portion of the water and do not anticipate a need to use it in the future. Under existing conditions this "excess" water would flow downstream to the Delta anyway or would remain as carryover storage in upstream reservoirs. Possible outcomes of such transfers could be increased dry year flows, reduced carryover storage in dry years, and reduced wet year flows. The change in river flow or reservoir storage under such a transfer would depend on negotiation of the details of the transfer and, therefore, cannot be fully evaluated at this time.

A second class of transfers may involve substitution of groundwater for surface supply on the part of the transfer source, or reduce reliance on surface supply by taking land out of production, water conservation, reclamation or some other means. Transfers from these sources could result in positive environmental impacts through reduced diversions by the transfer source and increased river flows between the existing point of diversion and the CCWD diversion. The extent of the benefit would depend on the timing of flow increases and diversion reductions and the relative severity of existing diversion-related fish losses. Transfer sources in this category may include Reclamation District 2068, Stony Creek Fan groundwater export, Thomes Creek Fan groundwater export, and City of Modesto wastewater reclamation.

Reducing upstream diversions and increasing river flow generally has the greatest benefit during April through June and September to October. Flow augmentation in April through June could be scheduled to benefit emigration of juvenile salmonids. Flow augmentation in September to October could benefit emigration of winter-run chinook salmon and upstream migration of adult salmon in some streams. The least benefit to fish upstream of the Delta would occur by July or August. Because of life history characteristics of the species involved, the greatest upstream benefits of water transfers from upstream resources would be at a time when receipt of this water at the CCWD pumps is likely to have the greatest downstream impact on Delta resources. From an environmental standpoint, the ideal transfer would involve reduced upstream diversions in April, May or June and delivery to CCWD in August and/or September.

Terrestrial Resources

The evaluation of water transfer impacts on terrestrial resources is summarized into constraints and opportunities. The evaluation is limited to the relationship between the amount of water available from each district and any anticipated changes in agricultural, municipal or industrial uses resulting from the transfer.

C-100333

Land use factors such as current zoning, general and specific plan conformance and existing irrigation were considered baseline conditions for the review of potential terrestrial impacts. Reviews of potential land development and use impacts were limited to comparing existing conditions to conditions projected with each transfer.

A qualitative assessment was undertaken of existing and potential water conveyance activities in existing natural settings and for engineered facilities. The need for new conveyance facilities, which would generate site-specific impacts, is also noted where applicable. The California Natural Diversity Data Base was reviewed for each transfer alternative to identify potential Endangered Species Act issues.

Modification of the stage, duration, and periodicity of river flows was qualitatively reviewed to consider relationships between water transfers and riparian and upland habitats. Although we considered this suite of impacts, final conclusions cannot be reached until detailed transfer operation modeling (including flow parameter models such as the suite of HEC models) and other analyses (e.g., CVPIA implementation planning) are completed.

SURFACE WATER TRANSFERS FROM THE SACRAMENTO VALLEY

Potential transfer sources identified in the Sacramento Valley include the Oroville-Wyandotte Irrigation District, Reclamation District 108, Sutter Mutual Water Company, Yuba County Water Agency, Natomas Central Mutual Water Company, East Bay Municipal Utility District, and Reclamation District 2068. Each of these sources is described below.

Oroville-Wyandotte Irrigation District

Aquatic Resources. Water is released from Oroville Dam through a multilevel outlet to provide appropriate water temperatures for the operation of the Feather River hatchery and to protect downstream fisheries (USFWS, 1995). Water is diverted approximately 5 miles below the dam at the Thermalito Diversion Dam into the Thermalito Power Canal and, ultimately, into the Thermalito Afterbay. Flow in the Feather River between the Thermalito Diversion and Thermalito afterbay (low flow section) is a constant 600 cubic feet per second (cfs). Unimpaired flows in the Feather River peak in April and May at about 10,000 cfs in a normal runoff year. Late summer unimpaired flows average less than 1,000 cfs. Dry year minimum flow can be less than 1,000 cfs throughout the year. Actual flows since completion of the Oroville-Thermalito complex have been reduced somewhat in the spring and increased during the summer. Water temperatures in the reach below the Thermalito afterbay are higher than those in the low flow section because of warming in the afterbay.

-4

The Feather River below Oroville Dam supports an important run of fall chinook salmon and a run of spring chinook salmon. The spring-run spawning stock has been estimated at 2,800 fish for the 1982-91 period, greater than the pre-project average of 1,700. The fall-run has numbered 51,400 in the later period and 39,100 before the projects. Anglers harvest an additional 10,000 spring and fall-run fish each year. The Feather River Hatchery is the only Central Valley source of eggs for the spring run (CDFG, 1993). Since fall run salmon and spring run salmon spawn in the same location and during overlapping time periods in the Feather River, these stocks have interbred (CDFG, 1994).

Fall-run salmon spawn in the Feather River during October through December. Spring-run adult salmon ascend the river in the spring and hold over the summer in deep pools in the low-flow section. Some of these fish spawn in riffles of the low-flow section during late September to late October and others enter the hatchery beginning in September. Spring-run adult holding and early spawning requirements are the driving forces behind the CDFG's water temperature and flow recommendations for the low-flow section. Decisions in recent years relating to operation of Oroville Reservoir have led to warmer water being released to the hatchery and in the low-flow section.

Steelhead in the Feather River are primarily of hatchery origin with only limited natural production of yearlings in the low-flow section. The hatchery mitigation goal is 2,000 steelhead. Returns to the hatchery have averaged 1,454 fish between 1982 and 1992 and the angler harvest has been estimated as high as 7,785 fish (CDFG, 1993). Steel-

head fingerlings rear in the river for a year or more before migrating downstream. Water temperature and flow conditions in the low-flow section are vital for the continued success of the Feather River steelhead program.

American shad spawn in the Feather River between April and June. In recent years, the number of shad entering the Feather River has been reduced (CDFG, 1993). CDFG assumes that its recommendations to benefit chinook salmon smolt rearing and migration in the spring will also benefit the shad fishery.

Striped bass also spawn in the Feather River in April through June and some resident striped bass are found in the river year-round. CDFG flow recommendations anticipate that spring flow recommendations will benefit striped bass spawning. Summer flow will support the striped bass and other resident fishes including smallmouth bass, catfish and brown trout.

Both green and white sturgeon have been found in the Feather River but the primary spawning areas are believed to be in the Sacramento River.

Fishery Management Issues. The OWID diversion is above Oroville Reservoir and therefore outside the range of fall or spring-run chinook salmon and other anadromous species using the lower Feather River. OWID operates the Lost Creek Dam and the Sly Creek Reservoir on the upper Feather River. CDFG has determined minimum releases to protect rainbow and brown trout fisheries as follows:

- Nov 1-July 15: 10 cfs
- July 16-Sep 30: 5 cfs
- Oct 1-Oct 31: 3 cfs

CDFG's river flow and water temperature recommendations for the Feather River below Oroville Dam are based primarily on the habitat needs of fall and spring-run chinook salmon. Recommendations for May and June flow also incorporate the needs of American shad.

CDFG recommendations to improve anadromous habitat in the Feather River include avoiding peaking power operations at Oroville Reservoir when storage is at or below 1.7 million acre-feet (MAF); maintaining 1.5 MAF of carryover storage in Oroville Reservoir on October 1 of each year to preserve cold water storage; and adoption of flow release criteria following completion of an instream flow study. Existing minimum streamflow requirements (below Thermalito outlet) are for 1,700 cfs from October through March and 1,000 cfs from April through September. In dry years these requirements are relaxed to 1,200 cfs from October through January and 1,000 cfs the rest of the year. Current recommendations for streamflow and temperature involve releases as high as 5,000 cfs during May and June of a normal or wet year and 2,625 cfs during May and June of a dry year. Recommended flows are minimum in late summer (1,125 in August of a normal or wet year and 1,050 in August of a dry year).

From April to June, CDFG recommends pulse flows to facilitate movement of juvenile salmon and steelhead and suitable temperature for fall-run chinook to be attained not later than September 15. Flow changes are not to exceed 200 cfs when discharge is less than 2,500 cfs during a 24-hour period.

In comments on a transfer of 15,000 ac-ft from OWID to Westlands, USFWS cited several concerns. These focused on potential impacts to the South Fork Feather downstream from Little Grass Valley and Sly Creek Reservoirs, and to the estuarine fishery. According to USFWS, the transfer from Little Grass Valley and Sly Creek Reservoirs during the period September 11 through October 15 would impact resident trout fisheries. The relatively high flows (up to 250 cfs) would encourage brown trout, a fall-spawning species, to spawn in downstream reaches that would be dewatered later in the fall when releases drop to the dry-year minimum flow requirement (5 cfs below Little Grass Valley Dam).

Another USFWS concern relates to impacts of reservoir drawdown during drought conditions. Depleting reservoir storage enables capture of more inflow that would otherwise augment spring spills important for maintenance of downstream fish habitat and facilitation of juvenile salmon and steelhead out-migration.

C-100335

According to USFWS, cumulative impacts from increased Delta pumping will result in proportionately greater losses of estuarine fishes, including endangered species. The agency recommended that the OWID consult with the National Marine Fisheries Service (NMFS) regarding this issue and the proposed water transfer. The agency further recommended that the OWID-Westlands transfer be denied to avoid possible fish losses related to Delta pumping.

Transfer Benefits/Impacts. It is assumed that water transferred under this alternative would exceed OWID's current needs. Therefore, significant changes in streamflow or reservoir storage relative to existing conditions are unlikely. Any transfer would be constrained by instream flow requirements both above and below Oroville Reservoir.

Water transferred from the OWID to CCWD could be scheduled to meet instream flow needs, particularly when releases for other purposes may be low. However, it is likely that water to be transferred is already meeting this purpose. Resource agency biologists believe that pulse flows in the spring may promote out-migration and enhance outmigration survival for fall and spring-run salmon smolts. The primary outmigration period is April, May and June. Augmentation of spring flow or spring flow pulses would be most beneficial in drier years. It is assumed that transfers would be passed through Oroville Reservoir and would not impact carryover storage in Oroville Reservoir for temperature control. This alternative will affect Delta pumping.

Terrestrial Resources. A search of the California Natural Diversity Data Base (CNDDB) was performed and the following terrestrial resources were reported in the vicinity of the irrigation district:

- ***Bald eagle*** - Bald eagles are known to nest at Little Grass Valley Lake. Since they prey mainly on fish, bald eagles need large bodies of water in order to forage. They usually nest in trees more than 100 feet tall, usually within 1 mile of the body of water they use for foraging.
- ***Bank swallow*** - This bird resides in its breeding grounds, including the Sacramento Valley, from late March to early September. Erosion is important to the natural banks, bluffs, and cliffs that the birds select for nesting, and in most cases running water creates and maintains these vertical surfaces.
- ***California hibiscus*** - This species grows is found in freshwater marshes and swamps. It blooms between August and September. It is seriously threatened by channelization of the Sacramento River and its tributaries.

Transfer Benefits/Impacts. The use of OWID water resources is not anticipated to significantly modify existing OWID operations; irrigation patterns, use and release schedules would continue to be based on similar irrigated acreages and the stage, duration and periodicity of river flows would not be altered. Accordingly, there will be few or no terrestrial impacts from changes in irrigation and land use patterns, and riparian impacts from flow modifications associated with the development of this water supply alternative.

Bald eagle reproduction may be adversely affected by extreme drawdown of reservoirs while chicks are in the nest. While this potential impact is not anticipated to be significant, USFWS has recommended that the OWID consult with Plumas National Forest regarding monitoring potential impacts to bald eagle nesting at Little Grass Valley Lake.

A water transfer from this district would involve foregoing the exercise of water rights on the South Fork of the Feather River and/or Slate Creek. It is believed that the OWID's rights are not currently used fully. Therefore, no major land use changes are expected from increased groundwater pumping or land fallowing.

Reclamation District 108

Aquatic Resources. The chinook salmon populations of the Sacramento River provide most of the state's sport and commercial catch (USFWS, 1995). Most of the Sacramento River flow is controlled by the USBR through storage and releases at Shasta Dam and diversion from the Trinity system. The upper Sacramento supports all four runs of chinook salmon, including the only remaining habitat for winter-run chinook and genetically isolated spring-run chinook (in tributaries). The fall-run has averaged 77,000 fish from 1967-91 but has declined during the recent drought, reaching a low of 29,000 in 1991. The late fall-run of chinook salmon averaged 14,000 over the 1967-91 period although numbers were consistently higher before 1974. Winter-run chinook have declined from an average

of approximately 80,000 adults in the 1960s to estimated runs of 547 in 1989, 441 in 1990, and 191 in 1991 (USFWS, 1995). The average winter-run from 1967-91 was 23,000 fish. Spring-run chinook salmon have averaged 13,000 from 1967-91. Spring-run and fall-run chinook probably interbreed when spawning time and location overlap in the mainstem Sacramento. Non-interbred populations of spring-run fish may still exist in Deer and Mill creeks where they are geographically isolated from fall-run fish. Spring-run are also present in some of the other Sacramento tributaries.

Steelhead runs in the Sacramento River above the Red Bluff Diversion Dam (RBDD) have averaged 6,574 fish spawning naturally from 1967-91. An unknown number of steelhead spawn below RBDD and in tributaries. Steelhead are also spawned at Coleman National Fish Hatchery on Battle Creek. The steelhead run above RBDD has shown a declining trend from 1967 to 1991 (USFWS, 1995).

Striped bass spawn in the Sacramento River primarily between Courtland and Colusa. Although variable, 50-66% of the annual egg production is from the Sacramento River (USFWS, 1995).

Shad spawn in the Sacramento River from late April to July and shad migrate as far upstream as RBDD. Some juvenile shad move downstream toward the Delta but large numbers may remain in fresh water into November (Reynolds et al., 1993).

White sturgeon migrate into the Sacramento River beginning in October and spawn primarily from March through May. Most spawning takes place between Knights Landing (river mile 85) and Princeton (river mile 164) with primary spawning areas near Colusa (USFWS, 1995). Nursery areas for juvenile white sturgeon extend down river from spawning areas to the Delta.

Average unimpaired flows typically peak between 15,000 and 20,000 cfs in February and March with minimum flows of less than 5,000 cfs occurring in July, August and September. In low flow years unimpaired flows can be less than 5,000 cfs in any month of the year. Peak wet year flows can reach 60,000 cfs in the winter months. Actual flows (1967-91 at Keswick) show little seasonal fluctuation on average. Minimum flows near 5,000 cfs occur in October and gradually increase to just over 10,000 cfs in February. Actual maximum flow approaches 40,000 cfs in March. During the irrigation season (April through September) actual flow exceeds unimpaired flow by a factor of two to three.

E-7

Fishery Management Issues. There are a number of fishery management issues in the Sacramento River. The water transfers under investigation potentially involve changes in carryover storage in Shasta Reservoir, change in river flow, and change in diversion of water from the Sacramento River.

The NMFS advocates a minimum carryover storage volume of 1.9 MAF in Shasta Reservoir on October 1 with some relaxation of this amount in critically dry years (NMFS, 1993), primarily for temperature control purposes related to maintenance of habitat for winter-run chinook salmon. Shasta Reservoir has a maximum storage capacity of 4.5 MAF. The magnitude of transfers being considered are not significant in terms of impacts on either maximum or carryover storage.

Flow recommendations for the Sacramento River are being developed as part of the Central Valley Improvement Act Anadromous Fish Restoration Program and are still in draft form. Current recommendations include peak flow in June, July and August as high as 10,000 to 12,000 cfs. Flow during the October to April period would range from a low of 3,250 cfs in a dry year to a high of 7,500 cfs in a wet year. April and May would have transitional flows increasing from lower flow in winter to the higher summer flow. The flow recommendations also call for experimental pulse flows totalling 120,000 ac-ft in April to benefit emigrating juvenile chinook salmon.

Approximately 1.2 MAF of water is diverted annually through unscreened diversions from the Sacramento River. The loss of juvenile salmonids in these diversions has been estimated at 10 million fish. Most of the impacts are between Ord Ferry and Knights Landing (The Resources Agency, 1989). Fall-run and late fall-run chinook salmon juveniles are particularly vulnerable to diversion-related mortality because they emigrate down the Sacramento River during the April through June period at the start of the irrigation season. Winter-run salmon are susceptible to

C-100337

diversion losses in September and October when the onset of their emigration season coincides with last part of the irrigation season. Losses of chinook salmon in diversions are minimal between the end of June and early September.

Causes of fish mortality at diversions include entrainment into the facility, physical injury related to diversion structures, and predation. Diversion facilities can lead to concentration of predators and disorientation of juvenile salmon, making them more susceptible to predation. Fish losses generally are increased under low-flow conditions because of earlier irrigation demands, greater ratio of diversion to river flow, increased metabolism of predators, and greater thermal stress and metabolic costs for emigrating juveniles. In high flow years, many juvenile chinook salmon emigrate from the upper Sacramento River in the early spring (February through April), avoiding the onset of the irrigation season.

Transfer Benefits/Impacts. It is assumed that water transferred under these alternatives would be excess to current needs. Therefore, it is unlikely that there would be significant changes in streamflow or reservoir storage relative to existing conditions.

Transfers could change flow in the Sacramento from the point of present diversion to the Delta. It is difficult to say what the change would be since details of the transfer would have to be negotiated. However, some degree of dry year flow increase with compensating decreases in wet years is a possibility. The significance of the change would depend on the time of year and the water year type.

A transfer to CCWD resulting in lower diversion at any of the facilities could reduce losses of juvenile salmonids. This is not likely to happen since the transfer would involve water not currently being diverted. The potential benefit would depend on the relative current impact of each diversion on juvenile salmonids. Also, the 50 TAF transfer is a relatively small amount compared to the 1.2 MAF of total annual diversion from the Sacramento River but could represent a significant reduction in any individual diversion. If appropriately timed, any losses of juvenile salmonids at one of the diversion facilities could be significantly reduced. The best time for a transfer to reduce fishery impacts would be during the April to June emigration period for fall-run and late fall-run chinook or during the September to October overlap of winter-run emigration and irrigation season. This alternative will affect Delta pumping (see Overview section earlier in this Appendix).

-8

Terrestrial Resources. A search of the CNDDB identified the following terrestrial resources were identified in the vicinity of Reclamation District 108:

- *California tiger salamander* - This species is a candidate for Federal listing as threatened or endangered (formerly Category 1) and is a California species of special concern. It may be associated with vernal pools.
- *Swainson's hawk* - Breeding Swainson's hawks need large expanses of grassland foraging habitat. In the absence of grasslands, many pairs forage in lightly grazed pasture, hay and alfalfa fields, and other agricultural lands. They arrive in their breeding areas from early March to early April. They construct nests in tall trees--such as oaks, cottonwoods, walnuts and willows--usually near rivers or streams adjacent to their hunting area.
- *Bank swallow* - Described above under Oroville-Wyandotte Irrigation District.
- *Tricolor blackbird* - The USFWS considers the tricolor blackbird a Species of Concern (formerly Category 2) for Federal listing as threatened or endangered. A principal factor in the tricolor's decline is elimination of wetland habitat. They prefer to breed in freshwater marshes with dense growth of emergent vegetation. Tricolors typically initiate nest building in early or mid-April.
- *Giant garter snake* - Conceals itself in thickets of tules, weeds, and willows that line the freshwater marshes, sloughs, and canals that it frequents. The snake pursues its prey in water. From late October to late March, giant garter snakes hibernate in abandoned rodent borrows above the high-water line.

Transfer Benefits/Impacts. The discharge of the Sacramento River is sufficient to assume that a transfer of the scale envisioned here would not noticeably affect river hydrology; the use of Reclamation District 108 water resources is

not anticipated to significantly modify existing District operations; irrigation patterns, use and release schedules would continue to be based on similar irrigated acreages and the stage, duration and periodicity of river flows would not be altered. Accordingly, no terrestrial impacts are anticipated from changes in irrigation and land use patterns, and riparian impacts from flow modifications associated with this water supply alternative.

Adverse impacts could be associated with possible land use changes resulting from the transfer. For example, rice fields provide habitat for the giant garter snake. Also, Swainson's hawks may be affected by possible changes to their (irrigated agriculture) foraging areas.

Sutter Mutual Water Company

Aquatic Resources. The Sutter Municipal Water Company transfer will affect Sacramento River resources in the same way as described above for Reclamation District 108. This alternative will affect Delta pumping (see Overview).

Terrestrial Resources. A search of the CNDDB was performed and the following terrestrial resources were reported in the vicinity of the water company service area:

Swainson's hawk - Described above.
Bank swallow - Described above.
Tricolor blackbird - Described above.
Giant garter snake - Described above.

Transfer Benefits/Impacts. It is believed that groundwater would be substituted for water transferred from this company. Therefore, adverse potential land use change impacts such as those described for Reclamation District 108, above, are not anticipated.

Yuba County Water Agency

Aquatic Resources. The CDFG reports 28 species of resident or anadromous fish from the Yuba River (CDFG, 1991). Sensitive and/or important species in the Lower Yuba River include fall-run chinook salmon, spring-run chinook salmon, steelhead, American shad, green sturgeon, white sturgeon, and striped bass. CDFG's management goals for the river are to optimize chinook salmon, steelhead trout, and American shad habitat conditions and populations. Bullard's Bar Reservoir is managed for kokanee, rainbow trout and warm-water game species. Fall-run and spring-run chinook salmon are emphasized because of their significant value to sport and commercial fishing interests.

The fall-run chinook salmon run size has varied from 1000 to 39,000 between 1953-89. About 60% spawn between Daguerre Point Dam and Hwy. 20 bridge. Spawning migration is from September to January with most in October to November. High water temperatures and low flows during critical periods may limit production. Low discharge and high temperature in October may delay spawning.

Spring-run chinook in the Yuba River may not be genetically isolated from the fall-run. The small native run disappeared by 1959. A remnant population persists, but these individuals may be strays from the Feather River or from infrequent stocking of hatchery-reared fish by CDFG. Spring-run salmon migrate into the Yuba River from March through July with most entering in May and June. They hold over the summer in deep, cool pools and spawn in September, October and into November. Juvenile emigration is from November through June.

The peak spawning migration for steelhead in the Yuba River is October through February. Steelhead spawn primarily from January through April and emergence of fry can extend into May and early June. From 1970-79, CDFG stocked 27,000 to 217,000 hatchery-reared fingerlings, yearlings, or subcatchables in the river. Areas used for steelhead spawning and rearing have not been determined.

The Lower Yuba supports a seasonal sport fishery for American Shad between Daguerre Point Dam and the Feather River from Late April into July. The shad run can be as high as 30-40,000 in some years. Females release 30,000 to 300,000 eggs. Seaward migration begins soon after hatching and the Yuba is not considered a nursery area for shad.

Striped bass do not migrate in the Yuba River past Daguerre Point Dam. Adults and juveniles move into the river in May and June. Striped bass eggs and larvae have not been recovered from the Yuba.

Fishery Management Issues. Instream flows for fishery resources have been a major subject of investigation and negotiation on the Yuba River in recent years. The SWRCB has held water rights hearings on these issues but no formal decision has been reached. Fall-run chinook salmon are the major focus of fishery management recommendations.

Temperatures downstream of Englebright Dam have increased since construction of New Bullards Bar from March through June, decreased July through December, and were unchanged December to March. Migration passage for chinook salmon at Daguerre Point Dam is considered adequate. Passage over shallow riffles was recently of concern (CDFG, 1991). A flow of at least 175 cfs below Daguerre Point Dam is required to meet upstream passage criteria for adult chinook.

YCWA supplies several diversions in the vicinity of Daguerre Point Dam. These include the Hallwood Irrigation Company, Cordua Irrigation District, Ramirez Water District, Brophy Water District, South Yuba Water District and Browns Valley Irrigation District. Diversions are usually from March through October and the CDFG has concluded that the impact of predation at these diversions may be substantial (Hall, 1979). CDFG has recommended that some of the existing screens be replaced (Reynolds et al., 1993)

The Hallwood Irrigation Company, Cordua Irrigation District, and Ramirez Water District divert through the Hallwood-Cordua canal. This gravity flow diversion has a maximum capacity of 625 cfs. The intake is screened with a V-shaped punched plate screen operated and maintained by CDFG. The screen is effective but predation losses occur. These losses have been estimated at 19 to 50% for test groups in 1977 and 1978 (Hall, 1979).

The Brophy Water District and South Yuba Water District divert through the Brophy-South Yuba Canal. This is also a gravity flow diversion and has a capacity of 380 cfs. The intake is screened by a rock levee that is permeable to fish
-10 including salmon (CDFG, 1987a). Studies using marked salmon found none in the diversion pool; however, 50% losses occurred in the bypass channel, assumed due to predation by Sacramento squawfish (CDFG, 1988).

The Browns Valley Irrigation District diversion is a pump diversion with a capacity of 80 cfs. The intake is screened by a gabion and smolt loss estimates range from 87 to 1,200 fish over 60 days at diversion flows of 10 to 75 cfs, respectively.

Transfer Benefits/Impacts. Transfers from the Yuba River would be subject to instream flow requirements and would most likely be scheduled to benefit fall-run chinook salmon. Flows in the Yuba River below New Bullards Reservoir, the Feather River below the Yuba River confluence and the Sacramento River below the Feather River confluence could be changed during the transfer period.

Flow augmentation would be most useful in the spring (April through June) to enhance conditions for juvenile emigration or in the fall (September through November) for the benefit of upstream migrating adults. Carryover storage for the purpose of temperature control would also be an issue.

Since a transfer from YCWA would involve water that exceeds the needs of its users, it is not clear that there would be any benefits from a transfer. One likely scenario is that dry year flows may be augmented with a corresponding reduction in wet year uncontrolled flows. This may have benefits for fall-run salmon in dry years. Any reduction in reservoir carryover storage may have detrimental temperature impacts in the fall. The details of any transfer would have to be defined before a more detailed analysis of impacts can proceed. This alternative will affect Delta pumping (see Overview).

Terrestrial Resources. Because the locations of irrigated lands in the area are not known, a CNDDB search was not made. Species of concern likely would be similar to those described for OWID.

Transfer Benefits/Impacts. Supply in excess of demand and groundwater substitution would be used to provide water for transfer and use within the agency service area; the use of YCWA water resources is not anticipated to

significantly modify existing District operations; irrigation patterns, use and release schedules would continue to be based on similar irrigated acreages and the stage, duration and periodicity of river flows would not be altered. Accordingly, no terrestrial impacts from changes in irrigation and land use patterns, and riparian impacts from flow modifications are expected to result from the development of this water supply alternative.

Natomas Central Mutual Water Company

Aquatic Resources. The Natomas Central Mutual Water Company transfer will affect Sacramento River resources in the same way as described above for Reclamation District 108. This alternative will affect Delta pumping (see Overview).

Terrestrial Resources. A search of the CNDDB was performed and the following terrestrial resources were found to have been reported in the vicinity of the water company service area:

Swainson's hawk - Described above.
Bank swallow - Described above.
Giant garter snake - Described above.

Transfer Benefits/Impacts. Natomas likely would employ conjunctive use to replace water supplied under contract to CCWD. No significant local or regional impacts are expected from this potential groundwater use and aquifer drawdown.

East Bay Municipal Utility District

Aquatic Resources. Gerstung (1971) lists 17 species as numerous or common. These include native species such as chinook salmon, steelhead, Pacific lamprey, Sacramento sucker, Sacramento squawfish, tule perch and riffle sculpin, as well as introduced species including American shad, striped bass, and other game and non-game species. American shad have been observed spawning in the Lower American River but no juvenile shad have ever been observed. Steelhead appear to be largely supported by releases of juveniles from Nimbus hatchery during the winter months.

E-11

The naturally spawning stock of fall-run chinook salmon in the lower American River averaged 32,000 fish from 1967 to 1991. An additional 8,700 fish returned to Nimbus Hatchery during the same period. Steelhead returns to Nimbus hatchery have averaged 1,700 during the 1967 to 1991 period. The number of steelhead spawning naturally in the lower American River has not been estimated.

Fishery Management Issues. There are many fisheries issues in the lower American River; however, this discussion is limited to issues associated with river flows and reservoir carryover storage.

EBMUD's proposed diversion of water from Nimbus Dam through the Folsom South Canal was challenged in a suit filed by the Environmental Defense Fund in 1972. A 1990 court decision resulting from this case set instream flows for the protection of aquatic public trust resources in the lower American River based largely on the needs of salmonid populations. This decision (the Hodge Decision, also called the Hodge Flows) set minimum required flows at 2,000 cfs between October 15 and February 28; 3,000 cfs between March 1 and June 30; and 1,750 cfs between July 1 and October 14. The Hodge Decision anticipated that these flow requirements may be reassessed as additional information becomes available.

The USFWS has recently developed flow recommendations for the purpose of doubling anadromous fish production under its responsibilities for developing an anadromous fish restoration program under the CVPIA. The flows recommended by USFWS are to facilitate doubling of chinook salmon and steelhead production in the lower American River. The flows recommended by USFWS would increase those required by the Hodge Decision in wet years and somewhat reduce flow requirements in dry and critical years. Under these recommendations, the needs for instream flows are balanced against the need to maintain water in storage for future releases and to maintain suitable temperature conditions in the lower American River. Flow fluctuation is also an issue for water transfers due to the potential for dewatering redds and stranding fry.

C-100341

Transfer Benefits/Impacts. Since EBMUD does not currently divert from the American River, there is no potential for a transfer to offset impacts resulting from existing diversion related fish losses. Any American River water transferred by EBMUD represents water that EBMUD is not currently using. There would be no opportunity to enhance flows since the water that would be transferred currently flows down the river anyway. If EBMUD were to develop its American River supply at some point in the future, a transfer to CCWD may be considered favorably because it would leave water in the river. Water that would otherwise be diverted would remain in the lower American River with the potential to schedule releases to benefit the anadromous fisheries and avoid any diversion-related problems. This alternative will affect Delta pumping (see Overview).

Terrestrial Resources. Terrestrial resources likely would be similar to those listed for OWID, as discussed above.

Transfer Benefits/Impacts. As noted above, due to the lack of a physical connection between the Folsom South Canal and the Mokelumne Aqueduct, this transfer of water would require the development of a linkage between these facilities or new downstream points of diversion. The development of a new water conveyance system from the Sacramento River or the Sacramento-San Joaquin River Delta would include impacts to terrestrial resources, as generated by project construction and operation. If this transfer is executed by the use of existing points of diversion (e.g., Rock Slough), it would not involve adverse impacts to terrestrial resources because it requires only a change in point of diversion.

Reclamation District 2068

Aquatic Resources. The transfer could affect fisheries in the Sacramento River. Fishery resources of the Sacramento River were previously described for possible water transfers from Reclamation District 108, Sutter Mutual Water Company and Natomas Central Mutual Water Company.

Fishery Management Issues. Fishery management issues in the Sacramento River were previously described for Reclamation District 108, Sutter Mutual Water Company and Natomas Central Mutual Water Company.

-12

Transfer Benefits/Impacts. This transfer could increase flow in the Sacramento from the point of present diversion to the Delta. It is difficult to estimate the magnitude and timing of the increase since details of the transfer would have to be negotiated. However, less diversion would be expected during the agricultural irrigation season, resulting in corresponding increased flow between the existing point of diversion and the CCWD Delta diversion facility. The significance of the change would depend on the water year type.

A transfer to CCWD is expected to result in lower diversion at Reclamation District 2068 facilities, thereby reducing losses of juvenile salmonids. The potential benefit would depend on the relative current impact of the diversions on juvenile salmonids. Also, the 20 TAF transfer is a relatively small amount compared to the 1.2 MAF of total annual diversion from the Sacramento River but could represent a significant reduction in the individual diversion. If appropriately timed, any losses of juvenile salmonids that may occur at one of the diversion facilities could be significantly reduced. The best time for a transfer to reduce fishery impacts would be during the April-June emigration period for fall-run and late fall-run chinook or during the September-October overlap of winter-run emigration and irrigation season.

Terrestrial Resources. Because the location of irrigated lands within the district are not known, a CNDDB search was not made. Terrestrial resources likely are similar to those identified for OWID, Reclamation District 108 and Natomas Central Mutual Water Company.

Transfer Benefits/Impacts. Reclamation District 2068 likely would employ conjunctive use to replace water supplied under contract to CCWD. The impact of this potential groundwater use on local and regional aquifer drawdown and related impacts to terrestrial resources is not anticipated to be significant. Therefore, no terrestrial resources impacts associated with possible land use changes are expected.

SURFACE WATER TRANSFERS FROM THE SAN JOAQUIN VALLEY

Potential sources in the San Joaquin Valley include the Modesto Irrigation District, CVP Exchange Contractors, Merced Irrigation District, and Berrenda Mesa Water District, as described below.

Modesto Irrigation District

Aquatic Resources. The Modesto and Turlock Irrigation Districts jointly regulate the flow to the lower Tuolumne River from New Don Pedro Reservoir. Unimpaired flows peak in April and May at over 6,000 cfs in a normal runoff year. Late summer unimpaired flows average less than 1,000 cfs. Dry year minimum flow can be less than 2,000 cfs throughout the entire year. Actual flows below LaGrange Dam now remain below 2,000 cfs throughout normal years, and fall below 1,000 cfs during the summer months. Extremely low flows occur during dry years.

The river now supports fall-run chinook salmon and a small population of late-fall-run chinook salmon. Annual estimates of fall-run chinook spawning escapement in the Tuolumne show considerable annual variability, with peak abundance generally following high spring runoff years. The 1967-1991 average estimated escapement is 15,000. In the falls of 1991 and 1992, however, fewer than 300 adults returned to spawn (Reynolds et al., 1993). Spring-run chinook were probably eliminated by 1930 as a result of dam construction.

Salmon spawn downstream from the New Don Pedro reservoir, in the 25-mile reach between LaGrange Dam and the town of Waterford, and rear in the entire lower river. LaGrange Dam is the upstream barrier to salmon migration.

Steelhead historically had sustained annual runs up the Tuolumne River. Conditions limiting steelhead included dams, water diversions, poor water quality and riparian impacts. On the Tuolumne River, low summer flows and concurrent high water temperatures precluded the necessary year-round rearing habitat for steelhead below the LaGrange Dam. Few, if any, naturally produced steelhead populations now exist in the San Joaquin River system, including the Tuolumne River.

Fishery Management Issues. The USFWS has identified streamflow as the primary factor affecting abundance of chinook salmon stocks in the San Joaquin River basin (USFWS, 1995a). Tuolumne River flow reductions after April and May result in poor survival conditions for chinook juveniles that remain beyond these months. Generally, water temperatures become unsuitable for chinook rearing in May or June, causing high mortality of juveniles that have not emigrated.

Interim instream flows for the Tuolumne are detailed in an agreement between CDFG and Modesto and Turlock Irrigation Districts. With present fall flow allocations, suitable temperatures for salmon spawning are commonly exceeded in a portion of the spawning reach in October. The following water quality objectives are currently in place for the Tuolumne:

- 56°F maximum from October 15 - February 15 to protect spawning and egg incubation throughout the designated spawning reach from LaGrange Dam to Waterford.
- 65°F maximum surface water temperature from April 1 - May 31 throughout the lower Tuolumne River to protect emigrating smolts.

CDFG now allocates as much flow as possible during the spring emigration period, but the total annual flow allocations do not provide sufficient water to meet the spring outflow needs and needs for other life stages. Summer flows are too low to sustain salmon or steelhead. The CDFG has determined that significantly higher flows are needed for salmon spawning and rearing on the lower Tuolumne River than are possible with the present allocations (USFWS, 1995b).

As part of the plan to double anadromous fish populations in the Central Valley, the USFWS has recommended a flow schedule for the Tuolumne River by year type. Under this schedule, minimum flow would be 100 cfs in all water year types except critical years. Spring flows would be increased to 2,350-4,200 cfs, and summer flows to

100-900 cfs during normal years. These flows would be required between LaGrange Dam and the confluence of the San Joaquin River.

Transfer Benefits/Impacts. Transfers from the Tuolumne River would be subject to instream flow requirements and would most likely be scheduled to benefit fall-run chinook salmon. Flows in the Tuolumne River below New Don Pedro Reservoir and the San Joaquin River below the Tuolumne River confluence could be changed during the transfer period.

Flow augmentation would be most useful for this purpose in the spring (April through June) to enhance conditions for juvenile emigration or in the fall (September through November) for the benefit of upstream migrating adults. Carryover storage for the purpose of temperature control would also be an issue.

Since a transfer from Modesto Irrigation District would involve water that is excess of the needs of its users, it is not clear that there would be any benefits from a transfer. One likely scenario is that dry year flows may be augmented with a corresponding reduction in wet year uncontrolled flows. This may have benefits for fall-run salmon in dry years. Any reduction in reservoir carryover storage may have detrimental temperature impacts in the fall. The details of any transfer would have to be defined in before a more detailed analysis of impacts can proceed.

This alternative also will affect Delta pumping (see Overview).

Terrestrial Resources. Because the location of areas irrigated by Modesto Irrigation District water users is not known, a CNDDB search was not performed. The transfer would not involve construction and the amount of water transferred is not expected to change system hydrology, thereby affecting riparian habitat.

Transfer Benefits/Impacts. This alternative likely would involve conjunctive use of groundwater to substitute for transfers. The impact of this potential groundwater use on local and regional aquifer drawdown and related impacts to terrestrial resources is not anticipated to be significant. Therefore, no terrestrial resource impacts associated with land use changes would be expected.

-14

CVP Exchange Contractors (Exchangers)

Aquatic Resources. The primary aquatic impact of CVP Exchange Contractors is at the CVP pumps near Tracy in the southern Delta. The San Francisco Bay-Delta Estuary supports about 90 species of fish. Most of the resident and migratory fish species using the Delta are susceptible to direct and indirect losses at these pumps because of entrainment into the pumps, physical injury on intake and screen facilities, predation in the vicinity of the facilities, and trucking and handling losses in the fish salvage facilities. This includes migratory species such as chinook salmon, steelhead, striped bass, American shad, and sturgeon; native resident species such as Delta smelt, longfin smelt, and Sacramento splittail; and non-native resident species including catfish, black bass, and bluegill.

Fishery Management Issues. Many factors influence the distribution of fish species within the Delta and their susceptibility to losses at the export facilities: pumping rates, flow patterns and tidal influence in Delta channels, time of year, age and life-stage, and probably others. Winter-run chinook salmon and Delta smelt are protected species and pumping may be constrained by take limits established by regulatory agencies. Several other Delta fish species have experienced some level of population declines in recent times and more listings of protected species are a possibility.

Transfer Benefits/Impacts. If a water transfer to CCWD resulted in less pumping at the CVP there may be an incremental reduction in fish losses. The magnitude of the reduction would depend on the timing and amount of the transfer and on whether there is a direct linear relationship between pumping rate and fish losses. Losses of many species are highest in the spring, particularly the April through June period when fall-run salmon are migrating through the Delta. Other species including American shad, striped bass, splittail, and Delta smelt can also be vulnerable into July and even August in some years. Winter-run salmon emigrating from the Sacramento River and steelhead are most commonly seen at the CVP between January and April although, in some years, winter-run may be seen earlier.

If the losses at the CVP are greater per ac-ft pumped than at CCWD pumping facilities, there would be a net benefit to Delta fisheries resulting from the transfer. Since the water that would be transferred by the CVP Exchangers is assumed to exceed their current needs, it is questionable whether any reduction in CVP pumping could be associated with the transfer, in which case no net benefit could be claimed. Some change in streamflow could result from this transfer alternative in CVP controlled streams but this has not been defined. This alternative will affect Delta pumping (see Overview).

Terrestrial Resources. Terrestrial resources would not be noticeably affected by the change in point of diversion.

Merced Irrigation District

Aquatic Resources. The Merced Irrigation District controls operation of New Exchequer Dam, which regulates releases to the lower Merced River. Unimpaired flows peak in May and June at nearly 4,000 cfs in a normal runoff year. Late summer unimpaired flows average less than 1,000 cfs. Unimpaired dry year minimum flow can be less than 2,000 cfs throughout the entire year. Actual flows below Merced Falls Dam now remain at or below about 2,000 cfs throughout normal years, and fall below 1,000 cfs during the winter months. Merced River flows of less than 100 cfs occur in the fall and winter of dry years.

Instream flows were established under the 1967 Davis-Grunsky Contract. Merced Irrigation District must maintain a continuous flow of between 180 and 220 cfs from November 1 through April 1 throughout the reach from Crocker-Huffman Dam to Shaffer Bridge. Legally required summer flow releases are low (15 to 25 cfs), and are usually depleted before they reach the mouth of the river due to riparian diversions throughout the lower river.

The Merced River now supports fall-run chinook salmon, and occasionally steelhead and late-fall-run chinook salmon. Annual estimates of fall-run chinook spawning escapement in the Tuolumne show considerable annual variability, with peak abundance generally following high spring runoff years. Annual estimates of fall-run spawning escapement in the Merced for the period 1967-1991 average 4,000. In fall of 1991, less than 100 fish returned to spawn at the Merced River Hatchery. Spring-run chinook salmon on the Merced River were probably eliminated by 1930 as a result of dam construction.

Few, if any, naturally produced steelhead populations exist in the San Joaquin River system, including the Merced River.

Fishery Management Issues. The DFG has concluded that flow releases are not sufficient to accommodate salmon migration, spawning, egg incubation, juvenile rearing and smolt emigration on the Merced and that water temperatures may exceed acceptable criteria for salmon during spring, summer and fall (Reynolds et al., 1993). Flows within the spawning reach during the spawning and early rearing period are further depleted due to riparian diversions. Spring flows for smolt migration are believed to be particularly inadequate (Reynolds et al., 1993). According to the DFG, significantly higher spring flows are needed in the lower Merced River during this period. Adequate releases for upstream migration do not begin until November 1, while the migration typically begins in October.

Merced Irrigation District is required to install and maintain fish screening devices at its six medium-sized diversions on the salmon spawning portion of the Merced River. Rock screens have been installed at four of the diversions, but the DFG has recommended they be replaced with more effective screens.

Measured stream temperatures on the Merced often exceed temperature tolerances for salmon spawning and egg incubation in October and early November in at least a portion of the spawning reach. In late April and May, stream temperatures often exceed stressful levels for emigrating smolts. The DFG recommends establishing the following water quality objective on the Merced River for the protection of salmon spawning, rearing and emigration:

- 65°F maximum surface water temperature from April 1 - May 31 to protect emigrating salmon throughout the lower Merced River.

Merced River streamflow reductions after April and May result in poor survival conditions for chinook juveniles that remain beyond these months. Generally, water temperatures become unsuitable for chinook rearing in May or

C-100345

June, causing high mortality of juveniles that have not emigrated. Proposed spring outflow recommendations for the Merced are designed to improve survival of emigrating juvenile chinook salmon.

As part of the plan to double anadromous fish populations in the Central Valley, the USFWS has recommended a flow schedule for the Merced River by year type. Under this schedule, minimum flow would be 200 cfs in all water year types. Spring flows would be increased to 1,150-2,300 cfs, and summer flows to 250-400 cfs during normal years. These flows would be required between Crocker-Huffman Dam and the confluence of the San Joaquin River.

Transfer Benefits/Impacts. Transfers from the Merced River would be subject to instream flow requirements and would most likely be scheduled to benefit fall-run chinook salmon. Flows in the Merced River below New Exchequer Dam, and the San Joaquin River below the Merced River confluence could be changed during the transfer period.

Flow augmentation would be most useful for this purpose in the spring (April through June) to enhance conditions for juvenile emigration or in the fall (September through November) for the benefit of upstream migrating adults. Carryover storage for the purpose of temperature control would also be an issue.

Since a transfer from Merced Irrigation District would involve water that is excess of the needs of its users, it is not clear that there would be any benefits from a transfer. One likely scenario is that dry year flows may be augmented with a corresponding reduction in wet year uncontrolled flows. This may have benefits for fall-run salmon in dry years. Any reduction in reservoir carryover storage may have detrimental temperature impacts in the fall. The details of any transfer would have to be defined in before a more detailed analysis of impacts can proceed.

This alternative also will affect Delta pumping (see Overview).

Terrestrial Resources. This transfer likely would involve conjunctive use and avoid land use changes that could affect terrestrial resources. The location of the irrigated lands in the district is not known and a CNDDB search was not made.

-16

Berrenda Mesa Water District (BMWD)

Aquatic Resources. The primary impact of BMWD water use is in the vicinity of the SWP export pumps in the south Delta. The fishery resources potentially affected by this transfer alternative are the same as those described above for the CVP Exchangers transfer.

Fishery Management Issues. Fishery management issues for this transfer alternative are essentially the same as those described above for the CVP Exchangers transfer, except that any reduction in pumping from the Delta would be at the SWP pumps rather than the CVP. For many fish species, losses per ac-ft pumped are higher at the SWP than at the CVP. Part of the reason for this difference has to do with high levels of indirect losses, particularly due to predation, in Clifton Court Forebay.

Transfer Benefits/Impacts. As for other transfer alternatives where water is currently pumped from the Delta, there could be a net benefit to Delta fisheries if the losses at the SWP are greater per ac-ft pumped than at CCWD pumping facilities. However, since land has already been taken out of production in the BMWD, there is no present use of the water to be transferred and no negative impacts that would be offset by the transfer. There may be some changes to upstream flow and fisheries habitat related to the transfer but these have not yet been defined. This alternative will affect Delta pumping (see Overview).

Terrestrial Resources. Terrestrial resources would not be noticeably affected by the change in point of diversion. The location of the irrigated lands in the district is not known and a CNDDB search was not made.

Transfer Benefits/Impacts. The availability of water resources from the BMWD is a direct result of removing irrigated lands from production. This fallowing of cropland has modified land use patterns within BMWD. The use of water made available by this land use change would not further impact local land uses and would not require new conveyance facilities; use of these water resources would not generate impact to terrestrial habitats or other resources.

SURFACE WATER TRANSFERS FROM CONTRA COSTA COUNTY

Potential sources in Contra Costa County include the East Contra Costa Irrigation District and Byron-Bethany Irrigation District, as described below.

East Contra Costa Irrigation District (ECCID)

Aquatic Resources. A water transfer from this source could affect fishery resources in the Delta. Fishery resources of the Delta have been described previously in the Overview. Further discussion is provided under CVP Exchange Contractors.

Fishery Management Issues. Fishery management issues related to the Delta have been described generally in the Overview. Further discussion is provided under the Fishery Management Issues heading for CVP Exchange Contractors.

Transfer Benefits/Impacts. If a water transfer to CCWD resulted in less pumping at the previous diversion point, there may be an incremental reduction in fish losses. The magnitude of the reduction would depend on the timing and amount of the transfer and on whether there is a direct linear relationship between pumping rate and fish losses. Losses of many species are highest in the spring, particularly the April through June period when fall-run salmon are migrating through the Delta. Other species including American shad, striped bass, splittail, and Delta smelt can also be vulnerable into July and even August in some years. Winter-run salmon emigrating from the Sacramento River and steelhead are most commonly seen at the CVP between January and April although some years winter-run may be seen earlier.

Since the transfer would involve water currently in use by the transfer source, a reduction in pumping from the original diversion point could be associated with the transfer, and a net benefit could be claimed if the losses at the existing diversion point are greater per ac-ft pumped than at CCWD pumping facilities.

Terrestrial Resources. Terrestrial resources would not be noticeably affected by the change in point of diversion.

Transfer Benefits/Impacts. This transfer would not involve adverse impacts to terrestrial resources because the transfer would consist of a change in the point of diversion involving existing pumping and distribution facilities.

Byron-Bethany Irrigation District (BBID)

Aquatic Resources. A water transfer from this source could affect fishery resources in the Delta. Fishery resources of the Delta have been described previously in the Overview. Further discussion is provided under CVP Exchange Contractors.

Fishery Management Issues. Fishery management issues related to the Delta have been described generally in the Overview. Further discussion is provided under the Fishery Management Issues heading for CVP Exchange Contractors.

Transfer Benefits/Impacts. Transfer impacts for this alternative would be similar to those described for the East Contra Cost Irrigation District. See also the Overview.

Terrestrial Resources. Terrestrial resources would not be noticeably affected by the change in point of diversion.

Transfer Benefits/Impacts. This transfer would not involve adverse impacts to terrestrial resources because the transfer would consist of a change in the point of diversion involving existing pumping and distribution facilities.

GROUNDWATER EXPORTS

Potential groundwater export sources include Stony Creek Fan and Thomes Creek Fan, as described below.

Stony Creek Fan

Aquatic Resources. The Stony Creek watershed has three storage reservoirs: Black Butte, Stony Gorge and East Park. The lowermost dam, Black Butte, is a barrier to anadromous fish. The Glenn-Colusa Irrigation District canal, which crosses Stony Creek downstream of Black Butte Dam, consists of a seasonal gravel dam constructed across the creek on the downstream side of the canal. This crossing allows water in the canal to continue flowing south and allows capture of Stony Creek water. It thus acts as a complete barrier to salmon migration when it is in place in the early part of the migration season.

Stony Creek supports fall-run chinook salmon in years when flow reaches the Sacramento River and adult fish are able to migrate into the creek to spawn. The DFG has characterized the spawning gravel quality as excellent between Black Butte Dam and the Sacramento River (Reynolds et al., 1993). There is a fishery for catfish, crappie and striped bass immediately below Black Butte Reservoir in the "afterbay" pool area.

A transfer from Stony Creek also could affect upper Sacramento River fisheries. Fishery resources of the Sacramento River have been described previously for possible water transfers from Reclamation District 108, Sutter Mutual Water Company and Natomas Central Mutual Water Company.

Fishery Management Issues. The USFWS has stated that Stony Creek could contribute to doubling salmon in the Sacramento River system through contributions below Black Butte Dam (USFWS, 1995b). The USFWS identifies a need to develop a water release schedule for Black Butte Dam to benefit salmonids by providing suitable flows for attraction, migration, spawning, incubation, rearing and outmigration. Also, the Tehama-Colusa Canal (TCC) was built with a turnout to provide water to Stony Creek for mitigation of fish loss caused by the RBDD. On occasion, water has been supplied to Stony Creek via the TCC, but it was not intended to benefit anadromous fish (USFWS, 1993b). According to the USFWS, Stony Creek fisheries would benefit from supplemental releases from the TCC, and a water release delivery schedule would need to be developed for that structure which is coordinated with the Black Butte Dam release schedule. Regulating water releases from Black Butte Dam and the TCC would aid in attaining the USFWS's escapement goals.

A minimum flow requirement of 10 cfs has been established to maintain the warmwater fishery and riparian habitat of Stony Creek.

On the upper Sacramento River, the RBDD is a major impediment to upstream migration of adult salmon. Vogel et al. (1988) concluded that adult salmon passage problems at the RBDD were caused primarily by insufficient attraction flows in the fish ladders, operation and maintenance problems and improper configuration of the fish ladder entrances. Also, temperatures in the Sacramento River below the RBDD frequently exceed tolerance levels for salmon eggs and fry during the summer incubation period (Hallock and Fisher, 1985).

Raising the RBDD gates during the non-irrigation season (November 1-April 30) is being implemented to facilitate upstream passage of adult winter-run chinook salmon. Downstream migrating juvenile salmon (primarily late fall- and winter-run salmon) also benefit from this measure because of unimpeded flow conditions past the dam, although predation rates during this period are thought to be low. USBR is investigating alternatives that would permit the RBDD gates to be raised permanently or for longer periods to provide unimpeded passage of adult and juvenile chinook salmon.

Losses of downstream migrating chinook salmon past the TCC and the RBDD during the chinook salmon emigration period occur as a result of entrainment through the TCC headworks, physical injury as juveniles pass through the headworks fish bypass system, and predation as juvenile salmon pass under the RBDD gates or through the fish bypass system (Vogel et al. 1988). The TCC headworks louver fish screens and bypass system were replaced with state-of-the-art rotary drum screens and an improved fish bypass system in 1990.

Transfer Benefits/Impacts. This transfer would involve reducing diversions at the RBDD into the TCC. If these diversions involved fish losses due to entrainment, a benefit could be claimed. The amount of benefit would depend on the timing of the diversion reductions and the ratio of fish losses to pumping rate at the time of diversion. It

should be noted that the diversion foregone likely would represent a small proportion of total diversions to the TCC. Net benefit/adverse impacts would depend on corresponding losses at CCWD pumping facilities.

The transfer also would involve increases in Sacramento River flows downstream of the RBDD. Benefits could apply to all salmon races. Again, it should be noted that the transferred water likely would comprise a small portion of total flows in the Sacramento River. The amount of benefit would depend on the schedule of releases and the type of water year in which the release occurred. The most favorable times to schedule releases would be the periods April to June to benefit fall-, spring- and late-fall-run chinook salmon. Releases in September and October could benefit juvenile winter-run salmon.

A water storage project in the Stony Creek watershed would have an unknown impact on Stony Creek fisheries. The impact would depend on the amount of water available during wet years to recharge the associated aquifer, the frequency of wet years and the hydrologic connectivity of the aquifer and Stony Creek.

Terrestrial Resources. The use of groundwater resources within the Stony Creek alluvial fan would not require new facilities or structural modifications. Absent significant aquifer drawdown and desiccation of habitats fed by the Stony Creek water table, this alternative would not generate significant terrestrial impacts.

Thomes Creek Fan

Aquatic Resources. Thomes Creek enters the Sacramento River at river mile 225. As is typical of west side streams, suitable flows for salmon reproduction are occasional at best. Historical records of flow in Thomes Creek reveal that in only 18 of 36 years are flows adequate to support salmon spawning (CDFG, 1961). The stream is usually dry or flows intermittently below the U.S. Geological Survey stream gage near Paskenta until the first heavy fall rains. Fall-run chinook enter and spawn in Thomes Creek in years of sufficient rainfall. Water diverted from the TCC into Thomes Creek has attracted salmon to the creek to spawn, only to have the redds dewatered when diversions ceased (pers. comm., N. Villa, Fisheries Biologist, CDFG, Rancho Cordova, CA).

No significant dams are located on Thomes Creek other than two seasonal diversion dams. Several small pump diversions are operated seasonally in the stream. The TCC was designed with a turnout structure to provide water to Thomes Creek for mitigation of the RBDD, and water was delivered to Thomes Creek via the TCC, but not for fishery purposes (Reynolds et al., 1993).

A transfer from Thomes Creek also could affect upper Sacramento River fisheries. Fishery resources of the Sacramento River have been described previously for possible water transfers from Reclamation District 108, Sutter Mutual Water Company and Natomas Central Mutual Water Company.

Fishery Management Issues. As part of the plan to double populations of anadromous fish in the Central Valley of California, the USFWS recommended that a release strategy be developed for the TCC into Thomes Creek to improve instream flows. According to the USFWS, if water is supplied, a minimum flow should be maintained from October through May to ensure survival for all life stages of winter-run chinook salmon. The USFWS believes that a minimum flow of 50 cfs should be released until a minimum flow can be determined (pers. comm., P. Ward, Fisheries Biologist, CDFG, Hamilton City, CA).

The discussion of RBDD-related issues provided under the Stony Creek alternative also applies to this alternative.

Transfer Benefits/Impacts. Possible fisheries impacts for this alternative are similar to those previously discussed under the Stony Creek alternative.

Terrestrial Resources. The use of groundwater resources within the Thomes Creek alluvial fan would not require new facilities or structural modifications. Absent significant aquifer drawdown and desiccation of habitats fed by the Thomes Creek water table, this alternative would not generate significant terrestrial impacts.

C-100349

WASTEWATER RECLAMATION EXPORTS

Potential wastewater reclamation export sources include the City of Tracy and the City of Modesto, as described below.

City of Tracy

Aquatic Resources. A water transfer from this source could affect fishery resources in the Delta. Fishery resources of the Delta have been described previously in the Overview. Further discussion is provided for CVP Exchange Contractors.

Fishery Management Issues. Fishery management issues related to the Delta have been described generally in the Overview. Further discussion is provided under the Fishery Management Issues heading for CVP Exchange Contractors.

Transfer Benefits/Impacts. Transfer impacts for this alternative would be similar to those described for the East Contra Cost Irrigation District. See also the Overview.

Terrestrial Resources. Terrestrial resources would not be noticeably affected by the change in point of diversion.

Transfer Benefits/Impacts. The utilization of reclaimed wastewater from the City of Tracy facility would not impact water-dependent land uses. Diversion of wastewater for CCWD use would not significantly modify river or slough stage, duration and periodicity or generate significant terrestrial impacts. Establishing further treatment for City discharges to the Tuolumne River would improve water quality in rivers and sloughs.

City of Modesto

Aquatic Resources. Historically, normal-year unimpaired flow of the San Joaquin River peaked at about 7,000 cfs in late April and early May. During the summer and fall, flows typically remained at or below 1,000 cfs. During the period 1967-1991, actual normal-year San Joaquin flows have been measured at or below about 1,500 cfs during the entire year. This measurement is made at Stevinson, just upstream from the point of discharge proposed by this transfer alternative.

-20

The most abundant historical salmon race, spring-run chinook salmon, was completely eliminated from the San Joaquin River after 1947 above the Merced River confluence following construction of Friant Dam, which blocked access to spawning and holding habitat and severely reduced flows in the river below the dam. Fall-run chinook also have been extirpated in the San Joaquin River from Friant Dam downstream to the confluence of the Merced River due to insufficient flow releases from Friant Dam. Low returns of fall-run salmon to San Joaquin tributaries also have been attributed to low flows in the lower San Joaquin River (USFWS, 1995a).

In the fall of 1991, an estimated 658 fall-run chinook returned to spawn in the San Joaquin River basin. According to the DFG, reductions in fall attractions flows and spring outflows on the mainstem San Joaquin River have significantly reduced adult returns, production and survival of salmon throughout the system. When spring outflow on the mainstem is high, the total adult salmon escapement in the San Joaquin basin is increased 2.5 years later. Low spring outflows from the basin in most years have been a major factor contributing to low salmon production (Reynolds et al., 1993).

Fishery Management Issues. Since the mainstem of the San Joaquin River upstream of the Merced River confluence has insufficient flows to support salmon populations, barriers (electrical and physical) were installed across the San Joaquin upstream of the confluence in 1992 to prevent migration into the San Joaquin River sloughs. Further, unsuitable temperatures for juvenile chinook salmon are found in the mainstem San Joaquin River and Delta. Emigrating juvenile chinook salmon experience high mortality in the lower San Joaquin River and Delta due to temperature and other factors (Reynolds et al., 1993).

There are no specific flow requirements in place in the mainstem San Joaquin River to meet the needs of migrating salmon. The DFG recommends that San Joaquin basin outflow standards be established to protect adults in the fall and emigrating smolts in the spring. Currently proposed spring outflow recommendations for San Joaquin River tributaries are designed in part to improve survival of juvenile salmon migrating down the mainstem San Joaquin River and through the Delta. Maximum survival benefits are expected by installing a barrier at the head of Old River during the spring emigration period in combination with reduced Delta exports and increased San Joaquin River flows.

The USFWS has recommended a spring flow schedule for various water year types for the mainstem San Joaquin River as part of a plan to double anadromous fish populations in the Central Valley (USFWS, 1995b). Flows are to occur just upstream of the Merced River confluence. During normal years, recommended flows in the San Joaquin River vary between 2,050-4,450 cfs in the period April to June. In critical years, recommended flows are in the range 1,050 to 1,600 cfs for this period.

Transfer Benefits/Impacts. This transfer would increase flows to a small extent in the San Joaquin River between the Merced River confluence and the Delta. The water likely would be released continuously throughout the year and would not be available in large quantities for "pulse" releases during the April to June period of juvenile fall-run chinook emigration or the September to December adult migration period. To provide a potential fisheries benefit, the water released by the City of Modesto would have to be relatively cold (i.e., well below salmon survival temperature criteria). Such releases could also benefit fisheries in San Joaquin River tributaries.

Terrestrial Resources. The utilization of reclaimed wastewater from the City of Modesto facility would not impact water dependant land uses. Diversion of wastewater for CCWD use would not significantly modify river or slough stage, duration and periodicity or generate significant terrestrial impacts. Establishing further treatment for City discharges to the Tuolumne River would improve water quality in the rivers and sloughs.

Technical Appendix F: Economic Analysis

SUMMARY

Present Worth costs for the six Resource Alternatives range between $265 and $831 million dollars. The Present Worth analysis is discussed in further detail below. Resource Alternative 4 was the highest cost Alternative based on the heavy reliance on higher levels of reclamation which require extensive treatment. Resource Alternative 5 ranked as the lowest cost, reflecting the long-term cost effectiveness of conservation due to the increased water savings each year. Resource Alternatives 1, 2, 3 ranged between $309 to $339 million. Costs for Resource Alternative 6 fell in the mid-range with a projected cost of $454 million, almost two times the lowest cost Alternative. Other economic factors were considered to narrow the selection of these Resource Alternatives even further, as discussed in this Technical Appendix.

ECONOMIC ANALYSIS

Three economic criteria were originally considered during the Round 2 evaluation of Resource Alternatives: 1) life-cycle costs, 2) rate impacts, and 3) indirect costs. An evaluation was performed through a least cost analysis based on Present Worth. Factors including reliability and implementability have an indirect effect on costs as well, and are also discussed in this Technical Appendix. Rate impacts were calculated to determine the potential effects of different rate structures on rate payers, and to gain a fuller understanding of the benefits and/or impacts of providing water to the different service areas. Rate impacts were calculated as a result of the Round 2 evaluation for only the three Resource Alternatives (1, 2 and 3) which ranked the most favorably based on an equal weighting of Reliability, Implementability, and Cost. Indirect costs were evaluated in terms of potential economic impacts on the county, employment sectors, and customer categories.

F-1

Cost Methodology

The determination of cost methodology was important to evaluate costs on a comparative scale and allow screening of the Resource Alternatives. To evaluate the Resource Alternatives on a consistent basis, a cost methodology was used that would lead to a balanced evaluation for each of the Resource Alternatives based on their individual components. Evaluation criteria Ec1 (Life-cycle Costs) and Ec2 (Rates), needed to be evaluated over time. The development of the Resource Alternatives focused on the year 2020, while the projection of costs spanned the majority of the Study period (i.e., 1997 to 2040). Due to the large number of components/projects within some of the Resource Alternatives, it was necessary to use a method that considered the long-term timing and implementation of the various projects. Capital costs may arise at different times and operations and maintenance (O&M) costs may vary throughout the Study period. Therefore, any means of evaluation would need to take these factors into consideration.

The Levelized Cost approach is usually presented for Resource Alternatives when capital costs occur up front, as demonstrated by Exhibit F-1. The Present Worth approach allows comparisons of Resource Alternatives where timing is important, and when com-

C-100352

ponents will be implemented over time. This was determined more suitable for the FWSS Resource Alternatives that include conservation, reclamation and water transfers at various points in time, as demonstrated by Exhibit F-2 (illustrating capital costs and O&M varying over time).

The Present Worth approach projects of actual spending over time assuming annual inflation; adjustments for timing of spending can be reflected in overall costs. This is important where a component, such as reclamation, is not scheduled to go on-line until the year 2020, for example. This approach allows the opportunity to vary the capacity to meet the growth in demand, by adding increments of supply to match incremental demand. The Present Worth methodology is more favorable than a Levelized Cost approach, for a study such as this, because it allows the phased implementation of all components (including conservation) to be placed on a common scale, allowing them then to be rated against the criteria. Projections of actual spending over time are based on when projects will come on-line and represent adjustments for timing of spending. Present Worth costs reflect what money will be worth at the time it will be spent, which is important for a long-term study of this nature.

Present Worth Cost Assumptions

The assumptions for the economic analysis followed existing District assumptions for planning, such as those of their 10-year Capital Improvement Program (CIP) as closely as possible. The assumptions used for calculating Present Worth costs for the six Resource Alternatives are as follows:

-2

- Annual inflation rate of 4%, consistent with the CIP (Surface water and spot transfers were calculated at a higher rate of 6.5%).
- Discount rate of 6.5% (the rate money will lose value in years to come).
- Facilities have a 30-year life, which represents an average for all facilities including pipelines and structures (which normally have longer lives) and motors and pumps (equipment which typically have shorter life spans).
- Unit costs represent the average over 43 years, 1997-2040, (calculated by dividing the Present Worth costs for each component by the total water supplied over the 43-year period).
- Facility construction is completed just prior to implementation (facility is constructed as required by demand).
- Unit costs of each component were combined (as appropriate) to develop a per ac-ft cost for each Resource Alternative, representing the average costs for the quantity of water developed for a particular Resource Alternative to the year 2040.

Component Costs

A summary of implementation, operations and maintenance cost estimates are included in this section. Estimates for implementation costs include consideration of construction, engineering, environmental mitigation, permitting and legal/institutional costs. Present Worth costs for the components were calculated based on the period 1997 to 2040.

The Present Worth cost of transfers are based on the purchase of water from other entities, and include pumping into and use of the Canal (currently a Bureau facility). Natural conveyance is assumed via the river to the District's intake. Different unit costs

Exhibit F-1
Levelized Cost Approach

Resource Alternative X: High initial capital expenditure

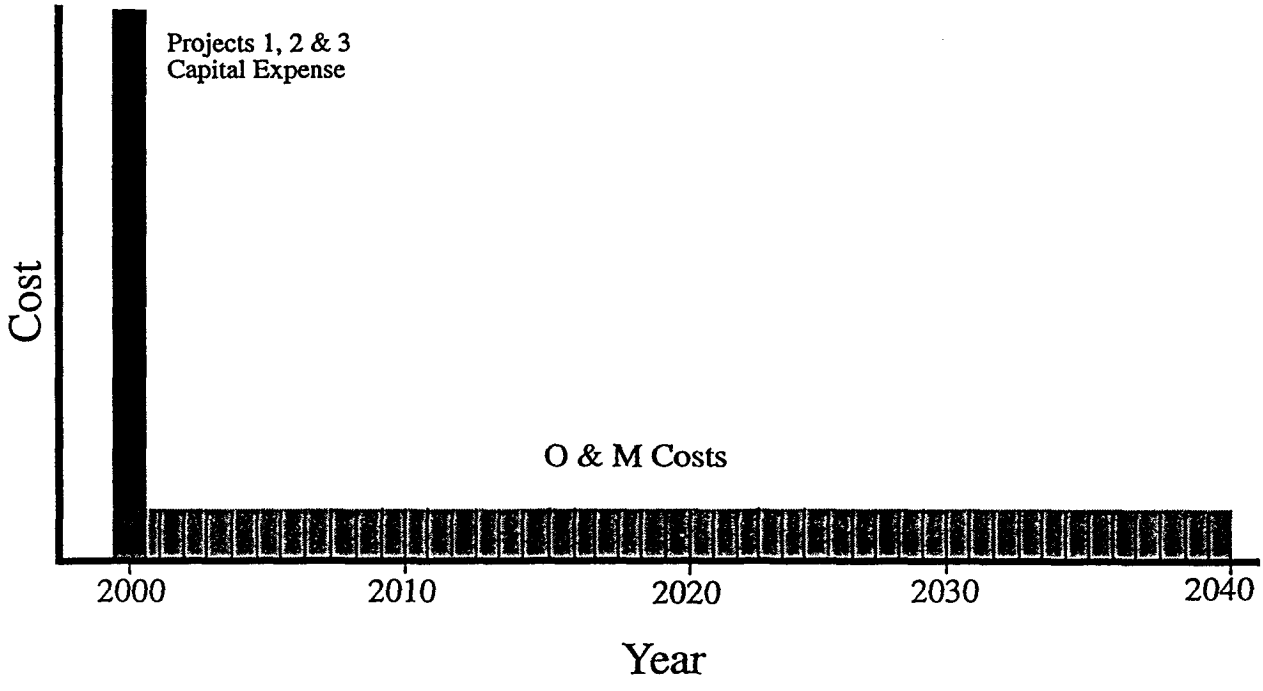
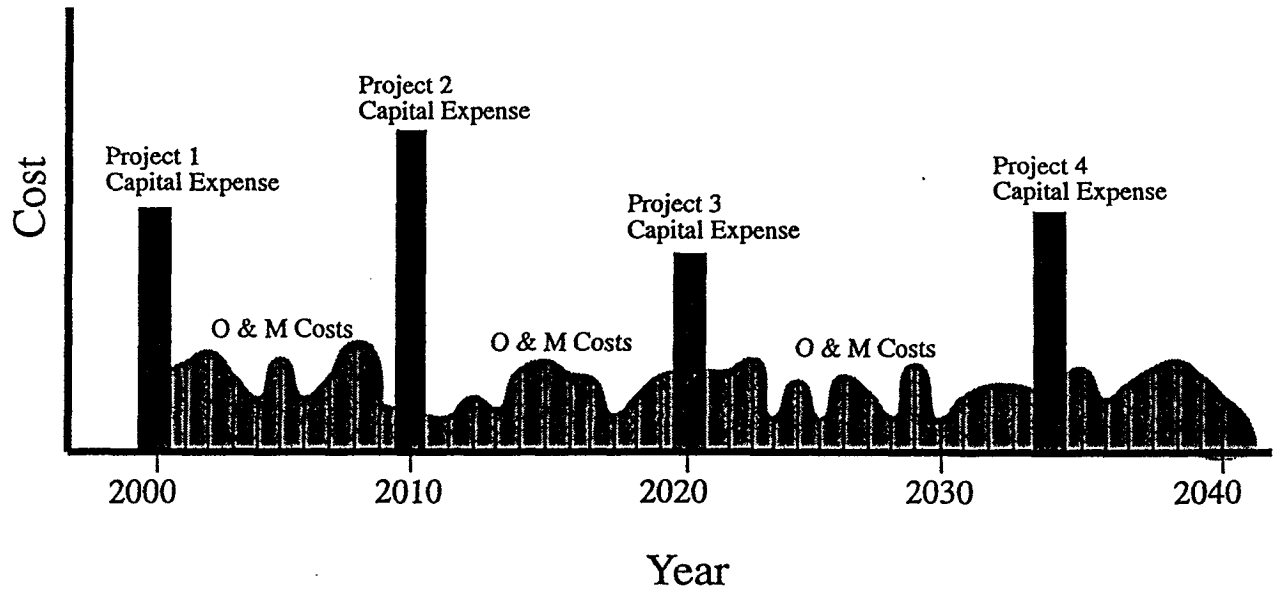


Exhibit F-2
Present Worth Cost Approach

Resource Alternative Y: Capital projects developed through phased implementation



C-100354

were used for long-term and spot water transfers. A unit cost of $50 to $175 per ac-ft in 1995 dollars was examined as a range based on current water prices on the market for long-term contracts. The high end of the range ($175) was used for the rate analysis. This was escalated at a higher rate (6.5% rather than 4%) to reflect the growing uncertainty of water supply availability. A unit cost for spot water transfers ranging from $125 to $300, which is comparable to rates recently paid by CCWD for drought bank water, reflects the higher cost of water during droughts. The high end of the range ($300) was used as a conservative estimate for the rate analysis.

Reclamation costs are primarily based on the cost of treatment and distribution. Three levels of treatment are included within the various reclamation projects being considered, which are reflected in the difference in unit costs. Conservation costs include those associated with implementing the measures for each program and are primarily related to increases in staffing for audits and Ultra Low Flush Toilet (ULFT) replacement incentives, with a small increase in public information staffing.

Drought management should not be confused with the conservation programs currently under study. Any additional costs incurred through implementation of a drought management (voluntary or mandatory reductions in water use) program, would be in addition to the costs estimated for the conservation programs studied. These costs were integrated during the rate analysis.

Component costs ranged in some cases (reclamation), depending on year of implementation, but the range has been included below.

Component	$/Ac-ft
CVP water	$38
Conservation - CPA 1	$161
Conservation - CPA 2	$113
Conservation - CPA 3	$93
Reclamation	
Project 1 (Central County Urban)	$590-$631
Project 2 (Antioch Urban)	$511-$527
Project 3 (Cooling Towers)	$431-$625
Project 4 (Boiler Feed Water)	$1,087
Water Transfers	
Surface Water Transfer	$198[1]
Spot Surface Water Transfer	$340[1]
ECCID Surface Transfer Water	$63

1 These 1997 Present Worth costs have been estimated as a worst case scenario. 1995 costs for this water ranged from $50 to $175 for surface water transfers and $125 to $300 for spot surface water transfers including pumping and in-Delta restoration charges. The high end of each range was used as a conservative estimate, and inflated at 6.5% for the Present Worth analysis.

Breakdown of Component Costs

Component costs were calculated both in terms of capital costs and O&M. Such costs will also assist the District in determining targets for future planning of the project specific components.

Urban Irrigation. Urban irrigation recycled water treatment would consist of granular media filtration followed by chlorine disinfection. The deep-bed monomedia filters are conservatively sized at a maximum hydraulic loading rate of 5 gpm/sq-ft and the chlorine contact basin is conservatively sized at a 120 minute hydraulic detention time. This treatment train will meet the requirements for Title 22 disinfected tertiary and the recycled water will be classified for unrestricted reuse. Specific projects examined as part of the FWSS include Central County and Antioch Urban Irrigation, as summarized below.

Central County Urban Irrigation. Granular media filtration is already provided at the Central Contra Costa Sanitary District (CCCSD) WWTP and the CCCSD Zone 1 recycled water transmission line will provide the required chlorine contact time. An urban irrigation recycled water pump station is under design as part of the CCCSD Zone 1 project.

Additional recycled water transmission facilities will be required for the Central County urban irrigation project to extend the CCCSD Zone 1 project into Pleasant Hill and Walnut Creek. Exhibit F-3 summarizes the capital and operations and maintenance (O&M) costs, in 1995 dollars, for this project.

Antioch Urban Irrigation. Additional treatment facilities at the DDSD WWTP and recycled water pumping and transmission facilities would be required for the Antioch Urban Irrigation Project. Granular media filtration, chlorine disinfection, and a recycled water pump station will be constructed at the DDSD WWTP. Recycled water transmission lines will be constructed to south Antioch and terminal storage reservoirs will provide diurnal equalization to match recycled water treatment flowrate with urban irrigation demand variations (i.e., recycled water is applied over a six-hour period at night).

A summary of the capital and O&M costs, in 1995 dollars, for this project is included in Exhibit F-4. Two project sizes are listed, a 2,100 ac-ft/year project and a 6,000 ac-ft/year project. The 6,000 ac-ft/year project, used in Service Areas E and F, reflects the total recycled water demand in areas of future development in south Antioch. The 2,100 ac-ft/year project, used in Service Area C, reflects recycled water demands in a portion of south Antioch.

F-5

Industrial Use. The treatment train for industrial use is based on providing ammonia removal through nitrification and phosphorus removal through precipitation for disinfected tertiary recycled water to meet cooling tower makeup requirements. Additional treatment by reverse osmosis (RO) would be provided to remove the majority of dissolved constituents to meet boiler feed requirements. Industrial use projects examined in the FWSS include Central County cooling tower makeup, Central County boiler feed, and agricultural irrigation, as summarized below.

Central County Cooling Tower Makeup. Two options were considered for the cooling tower makeup project. Both options will meet cooling tower operating goals for scaling, corrosion, and microbiological growth. Two specific recycled water constituents of concern are ammonia nitrogen and phosphorus. Ammonia nitrogen promotes biological growth in recirculating cooling tower systems and causes stress corrosion cracking in admiralty brass heat exchangers used at the refineries. Phosphorus, as phosphate, can combine with calcium to form calcium phosphate scale. Removal of these two constituents is key to maintaining at least 5 cycles of concentration in the refinery cooling towers; running at fewer cycles of concentration to accommodate recycled water is not feasible because the higher blowdown rates will overload existing refinery wastewater treatment plants. Both options will use the existing industrial pump station, reservoirs, and transmission lines to Shell and Tosco.

The first option will provide only nitrification for ammonia removal for 1,700 ac-ft/year, approximately 13 percent of the total cooling tower makeup requirement. Stand-alone fixed film nitrifying granular media reactors will be used to treat disinfected tertiary recycled water on the CCCSD WWTP site; a stand-alone reactor eliminates nitrification capacity issues with the existing CCCSD WWTP aeration basins. This

C-100356

Exhibit F-3
Central County Urban Irrigation Recycled Water Costs

Component	Capital Cost (ENR CCI = 6550)			Operation and Maintenance Costs		Totals [c]
	Project Cost [a]	Amortized Cost [b]	Amortized Unit Cost [b] ($/af)	Annual ($/yr)	Unit Cost ($/af)	
Treatment:						
Granular Media Filtration	$0	$0	$0	-	-	
Chlorine Disinfection	$820,000	$74,423	$44	-	-	
Subtotal	**$820,000**	**$74,423**	**$44**	**$50,610**	**$30**	**$80**
Distribution:						
Transmission Piping	$10,465,000	$949,803	$563	$53,000	$31	
Reservoirs	$7,031,000	$638,134	$378	$0	$0	
Main Pump Station	$1,394,000	$126,519	$75	$297,000	$176	
Booster Pump Stations	$4,946,000	$448,899	$266	$167,000	$99	
Subtotal	**$23,836,000**	**$2,163,355**	**$1,282**	**$517,000**	**$307**	**$1,590**
Total	**$24,660,000**	**$2,238,000**	**$1,326**	**$567,610**	**$337**	**$1,670**

Notes:
a - Capital costs include a 30% contingency allowance and a 30% engineering, legal, and administration allowance
b - A/P (6.5%, 20 yr) = 0.09076
c - Rounded up to nearest $10/af
Annual recycled water production = 1,687 af/yr
Planning level cost estimates have a range of +/- 30%

6

Exhibit F-4
Antioch Urban Irrigation Recycled Water Costs

Component	Capital Cost (ENR CCI = 6550)			Operation and Maintenance Costs		Totals [c]
	Project Cost [a]	Amortized Cost [b]	Amortized Unit Cost [b] ($/af)	Annual ($/yr)	Unit Cost ($/af)	
Option 1 (2,100 af/yr):						
Treatment:						
Granular Media Filtration	-	-	-	-	-	
Chlorine Disinfection	-	-	-	-	-	
Subtotal	**$8,113,000**	**$736,336**	**$351**	**$63,000**	**$30**	**$390**
Distribution:						
Transmission Piping	-	-	-	-	-	
Reservoirs	-	-	-	-	-	
Main Pump Station	-	-	-	-	-	
Booster Pump Stations	-	-	-	-	-	
Subtotal	**$16,239,000**	**$1,473,852**	**$702**	**$609,000**	**$290**	**$1,000**
Total	**$24,360,000**	**$2,211,000**	**$1,052**	**$672,000**	**$320**	**$1,380**
Option 2 (6,280 af/yr):						
Treatment:						
Granular Media Filtration	-	-	-	-	-	
Chlorine Disinfection	-	-	-	-	-	
Subtotal	**$24,402,000**	**$2,214,726**	**$353**	**$188,400**	**$30**	**$390**
Distribution:						
Transmission Piping	-	-	-	-	-	
Reservoirs	-	-	-	-	-	
Main Pump Station	-	-	-	-	-	
Booster Pump Stations	-	-	-	-	-	
Subtotal	**$48,538,000**	**$4,405,309**	**$701**	**$1,821,200**	**$290**	**$1,000**
Total	**$72,940,000**	**$6,621,000**	**$1,054**	**$2,009,600**	**$320**	**$1,380**

Notes:

a - Capital costs include a 30% contingency allowance and a 30% engineering, legal, and administration allowance

b - Capital recovery factor = 0.09076 (6.5 percent interest rate, 20 yr amortization period)

c - Rounded up to nearest $10/af

Planning level cost estimates have a range of +/- 30%

type of reactor is currently used for the West Basin Municipal Water District project that provides recycled water to the Chevron and Mobil refineries in the Los Angeles area. Blending of a small quantity of nitrified recycled water with raw water from existing refinery cooling tower makeup water systems eliminates the need for phosphorus removal. This option represents a starting point for recycled water use at Shell and Tosco and essentially "drought-proofs" their cooling tower makeup water supply.

The second option would provide nitrification and phosphorus removal to meet the full 13,300 ac-ft/year cooling tower makeup water demand. Nitrification will be similar as described above. Phosphorus removal will be provided to meet cooling tower makeup water quality needs when recycled water is used for 100 percent of cooling tower makeup requirements. Aluminum or iron salts would be added to a reactor/clarifier and the settled sludge would be pumped to the Bollman WTP for co-disposal with the water treatment plant sludge.

The capital and O&M costs, in 1995 dollars, for the high and low cooling tower makeup project options are summarized in Exhibit F-5.

Central County Boiler Feed. The boiler feed project is an extension of the cooling tower makeup water project described above and would meet boiler operating goals for scaling and corrosion at elevated pressures and temperatures. Accordingly, demineralization is required to meet these goals and RO is included in the treatment train. Implementation of the boiler feed water project requires that the cooling tower makeup recycled water treatment systems be expanded to a capacity of 25,500 ac-ft/year. Cooling tower makeup water would be pumped to the two refineries where 13,300 ac-ft/year will be used for cooling tower makeup; the remainder will be further treated using RO to remove nearly all dissolved constituents.

-8

The capital and O&M costs, in 1995 dollars, for the 12,200 ac-ft/year boiler feed water project are summarized in Exhibit F-6.

Agricultural Irrigation. Agricultural Irrigation was considered for Service Areas E and F. However, this component has not been included within the six Resource Alternatives for this analysis, but held for consideration at a later time. However, the component costs for agricultural irrigation have been included for comparison within Exhibit F-7.

Water Transfers. The entire cost of purchased water rights to meet drought year demands is paid for by ongoing water rates including raw water rates for future facilities. For future water transfers required to meet increased demand, the cost of water transfers could be assigned to the rate for raw water facilities.

Surface Water Transfers (all years). O&M costs for a surface water transfer were based on 1995 costs of $50 to $175 per ac-ft annually for a long-term transfer including pumping and in-Delta restoration charges, which account for costs of approximately $40 per ac-ft annually.

Spot Surface Water Transfers. O&M costs for a surface water transfer were based on 1995 costs of $125 to $300 per ac-ft annually for a long-term transfer including pumping and in-Delta restoration charges, which account for costs of approximately $40 per ac-ft annually.

Exhibit F-5
Central County Industrial Use Recycled Water Costs, Cooling Tower Makeup Water

Component	Capital Cost (ENR CCI = 6550)			Operation and Maintenance Costs		Totals [c]
	Project Cost [a]	Amortized Cost [b]	Amortized Unit Cost [b] ($/af)	Annual ($/yr)	Unit Cost ($/af)	
Option 1 (1,700 af/yr):						
Treatment:						
Granular Media Filtration	-	-	-	$391,000	$230	
Chlorine Disinfection	-	-	-	[d]	[d]	
Nitrification	$4,300,000	$390,268	$230	$663,000	$390	
Subtotal	**$4,300,000**	**$390,268**	**$230**	**$1,054,000**	**$620**	**$850**
Distribution:						
Pump Station	-	-	-	$59,500	$35	
Transmission Piping	-	-	-	$22,100	$13	
Reservoirs	-	-	-	$28,900	$17	
Subtotal	**$0**	**$0**	**$0**	**$110,500**	**$65**	**$70**
Total	**$4,300,000**	**$391,000**	**$230**	**$1,164,500**	**$685**	**$920**
Option 2 (13,300 af/yr):						
Treatment:						
Granular Media Filtration	-	-	-	$3,059,000	$230	
Chlorine Disinfection	-	-	-	[d]	[d]	
Phosphorus Removal	$14,797,000	$1,342,976	$101	$3,325,000	$250	
Nitrification	$33,663,000	$3,055,254	$230	$5,187,000	$390	
Subtotal	**$48,460,000**	**$4,398,230**	**$331**	**$11,571,000**	**$870**	**$1,210**
Distribution:						
Pump Station	-	-	-	$465,500	$35	
Transmission Piping	-	-	-	$172,900	$13	
Reservoirs	-	-	-	$226,100	$17	
Subtotal	**$0**	**$0**	**$0**	**$864,500**	**$65**	**$70**
Total	**$48,460,000**	**$4,399,000**	**$331**	**$12,435,500**	**$935**	**$1,270**

Notes:

a - Capital costs include a 30% contingency allowance and a 30% engineering, legal, and administration allowance

b - Capital recovery factor = 0.09076 (6.5 percent interest rate, 20 yr amortization period)

c - Rounded up to nearest $10/af

d - Included in granular media filtration operation and maintenance costs

Planning level cost estimates have a range of +/- 30%

Exhibit F-6
Central County Industrial Use Recycled Water Costs, Boiler Feed

Component	Capital Cost (ENR CCI = 6550)			Operation and Maintenance Costs		Totals [c]
	Project Cost [a]	Amortized Cost [b]	Amortized Unit Cost [b] ($/af)	Annual ($/yr)	Unit Cost ($/af)	
Treatment:						
Granular Media Filtration	-	-	-	$2,806,000	$230	
Chlorine Disinfection	-	-	-	[d]	[d]	
Phosphorus Removal	$14,896,000	$1,351,961	$111	$3,050,000	$250	
Nitrification	$33,887,000	$3,075,584	$252	$4,758,000	$390	
Reverse Osmosis	$70,430,000	$6,392,227	$524	$6,405,000	$525	
Subtotal	**$119,213,000**	**$10,819,772**	**$887**	**$17,019,000**	**$1,395**	**$2,290**
Distribution:						
Pump Station	-	-	-	$427,000	$35	
Transmission Piping	-	-	-	$158,600	$13	
Reservoirs	-	-	-	$207,400	$17	
Subtotal	**$0**	**$0**	**$0**	**$366,000**	**$65**	**$70**
Total	**$119,220,000**	**$10,820,000**	**$887**	**$17,385,000**	**$1,460**	**$2,350**

Notes:

a - Capital costs include a 30% contingency allowance and a 30% engineering, legal, and administration allowance

b - Capital recovery factor = (0.09076 (6.5 percent interest rate, 20 yr amortization period)

c - Rounded up to nearest $10/af

d - Included in granular media filtration operation and maintenance costs

-10

Annual recycled water production = 12,200 af/yr

Planning level cost estimates have a range of +/- 30%

Exhibit F-7
East County Agricultural Irrigation Recycled Water Costs

Component	Capital Cost (ENR CCI = 6550)			Operation and Maintenance Costs		Totals [c]
	Project Cost [a]	Amortized Cost [b]	Amortized Unit Cost [b] ($/af)	Annual ($/yr)	Unit Cost ($/af)	
Treatment:						
Tertiary Treatment:						
Brentwood WWTP	$16,200,000	$1,470,312	$324	$598,000	$132	
Ironhouse Sanitary District WWTP	$11,800,000	$1,070,968	$325	$435,000	$132	
Discovery Bay WWTP	$3,600,000	$326,736	$330	$131,000	$132	
Subtotal	**$31,600,000**	**$2,868,016**	**$325**	**$1,164,000**	**$132**	**$460**
Distribution:						
Pump Station:						
Brentwood WWTP	$1,000,000	$90,760	$20	$50,000	$11	
Ironhouse Sanitary District WWTP	$1,700,000	$154,292	$47	$85,000	$26	
Discovery Bay WWTP	$300,000	$27,228	$28	$14,000	$14	
Transmission Piping:						
Brentwood WWTP	$3,700,000	$335,812	$74	$18,500	$4	
Ironhouse Sanitary District WWTP	$7,600,000	$689,776	$209	$38,000	$12	
Discovery Bay WWTP	$2,800,000	$254,128	$257	$14,000	$14	
Reservoirs:						
Brentwood WWTP	$5,800,000	$526,408	$116	$29,000	$6	
Ironhouse Sanitary District WWTP	$4,400,000	$399,344	$121	$22,000	$7	
Discovery Bay WWTP	$1,700,000	$154,292	$156	$8,500	$9	
Subtotal	**$29,000,000**	**$2,632,040**	**$298**	**$279,000**	**$32**	**$340**
Total	**$60,600,000**	**$5,501,000**	**$624**	**$1,443,000**	**$164**	**$790**

F-11

Notes:
a - Capital costs include a 30% contingency allowance and a 30% engineering, legal, and administration allowance
b - Capital recovery factor = 0.09076 (6.5 percent interest rate, 20 yr amortization period)
c - Rounded up to nearest $10/af
Annual recycled water production = 8,819 af/yr (Brentwood WWTP = 4,533 af/yr, Ironhouse Sanitary District = 3,297 af/yr, Discovery Bay WWTP = 989 af/yr).
Planning level cost estimates have a range of +/- 30%

Delivery Assumptions

Present Worth costs were projected for each Resource Alternative based on the additional needs required for *full* delivery of water in *all* years. For drought years, costs associated with meeting supply shortfalls were computed for two cases: (1) with no short-term demand management program, and (2) with a 15% short-term demand management program. Sensitivity runs were also conducted using varying levels of programs, discussed further in Chapter 7. For cost estimating and implementation schedule analyses, reductions in water supplies attributed to the CVPIA were assumed to occur in the year 2010.

Exhibit F-8 displays a graph representing the needs for additional water in normal and drought years. The sharp increase after the year 2010, in the graph, represents the anticipated reduction of CVP supplies from 195,000 ac-ft to 166,000 ac-ft during a normal year, and further reduction to 140,000 ac-ft during a drought. The graph represents those quantities which would still be needed during a drought, even if the District were to implement a reduced delivery system of 15% drought management.

The difference between meeting full delivery during a normal and drought year under projected demands would be 26,000 ac-ft. The potential for an earlier onset of a CVPIA reduction exists; based upon the District's perceptions, an earlier renewal of their contract may prove beneficial. At first glance, a preliminary examination of the District's existing contract shows that it may be in the District's interest to delay renewal, since the fine for later renewal (after approval of the PEIS) equates to approximately $18 per ac-ft, on the total delivery (or at least $2.8 million per year) which might be less expensive than the cost of a supplemental water supply. For this reason, it may pay for the
-12 District to delay renewal until 2010; however, financial and water supply implications may prove it prudent to negotiate with the Bureau earlier.

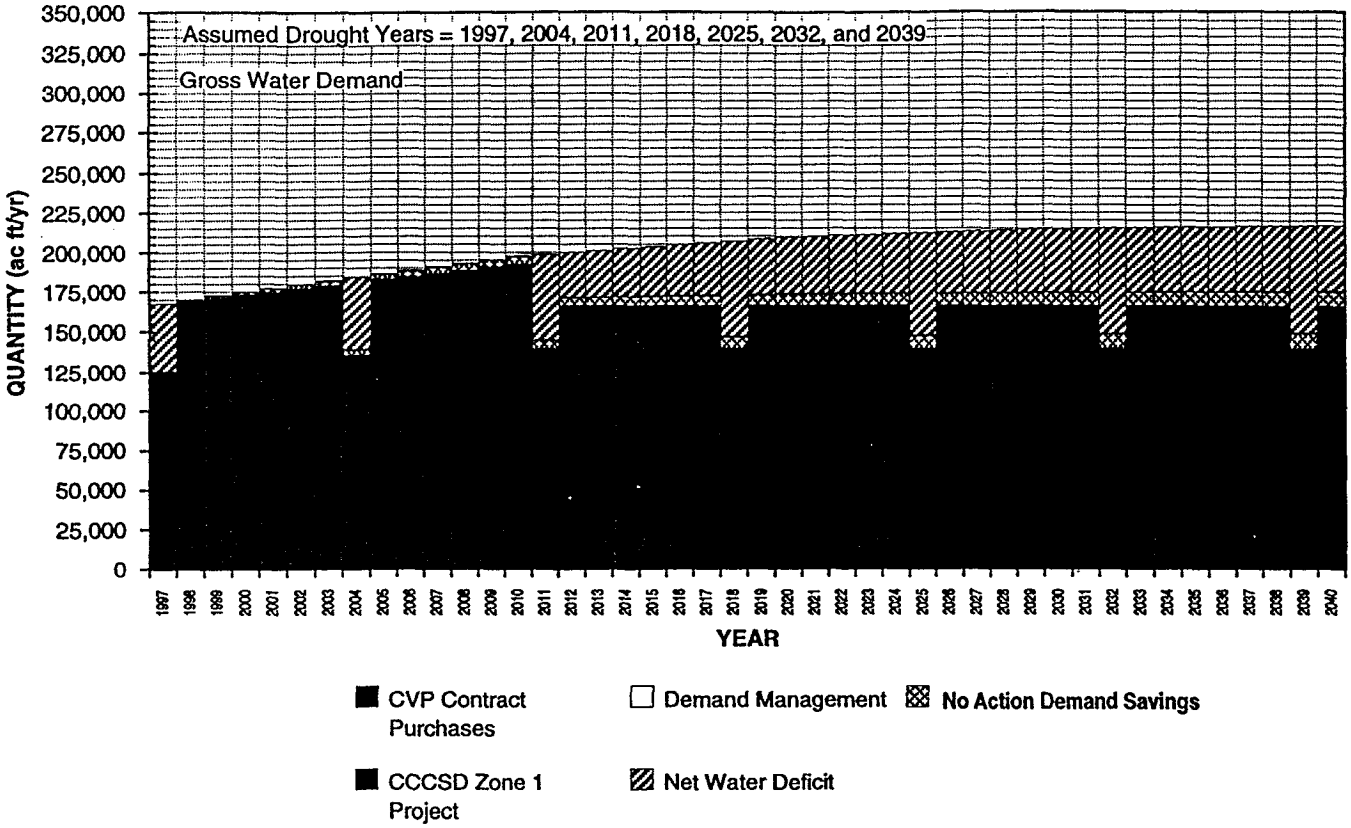
Present Worth Costs

Present Worth costs were used to compare and rank the Resource Alternatives. Costs were developed based on implementation of each Resource Alternative in the year 1997 with supplies extending out to the year 2040. Costs were studied in most detail for Service Area C, but are also presented for the larger Service Areas E and F. The total cost for each Resource Alternative includes the purchase of spot surface water transfers during drought years, estimated to occur approximately every seven years.

Implementation and timing of projects is consistent throughout the Resource Alternatives. Conservation is implemented immediately, beginning in 1997. Reclamation would begin construction in 2007 at the earliest with water savings beginning by 2010 (for some Alternatives), when CVP supplies are reduced. In some cases reclamation is not implemented until 2017 with water savings beginning in the year 2020. Savings associated with Phase I of the Central County Urban Irrigation project, currently being implemented by CCCSD (Zone 1 Project), are shown beginning in 1997 with no Present Worth cost associated to the District. Surface water transfers would begin approximately in the year 2010, again, when supplies are reduced by the Bureau.

Operational costs include all annual expenses to the District as well as possible rate impacts to customers. Timing of projects, including environmental documentation, engineering design, environmental compliance and planning and construction of project components, were addressed through a timeline with 10-year intervals distributed over

Exhibit F-8
Service Area C
Projected Water Demands and Net Water Deficit



F-13

the 50-year study period. The timeline was used to plot critical development paths to implement facilities in time to meet projected demands, and pinpoint crucial decision-making points where projected demands are compared with actuals and adjustments are made.

Unit Costs

Unit costs were used to assess implementation issues for each of the six Resource Alternatives, including timing and phasing of projects and components. Implementation factors include the calculation of rate impacts which like Present Worth costs were calculated over a 43-year period (1997-2040). In general, reclamation projects had the highest unit cost ($431-$1,087), due to the high cost associated with increased levels of treatment and new distribution systems for urban irrigation. Conservation had the lowest unit costs ($93-$161) due to the increased levels of accumulated water savings. Unit costs were used to assist the District as a guideline on cost issues for the programming and development of specific components. The following is a discussion of both Present Worth and Unit costs for the six Resource Alternatives.

Resource Alternative 1. Resource Alternative 1, based primarily on transfers, has a total cost of $336 million for Service Area C. Exhibit F-9 illustrates the Resource Alterna-

tive over time. The cost includes implementation of CPA 1 in 1997, with surface and spot water transfers making up the balance, out to the year 2040. The largest portion of this cost is from the inclusion of surface water transfers. Costs for Service Areas E and F are $384 million and $612 million, respectively. These increased costs reflect the addition of ECCID water, which has a 1995 O&M cost of $63 per ac-ft, and an increased quantity of transfers to support the larger demand.

Unit costs for this Resource Alternative are $208, $151 and $163 for Service Areas C, E and F, respectively. For this Resource Alternative, as with most which will be discussed, the lowest per ac-ft cost is for Service Area E. This is largely due to the inexpensive water supply gained (ECCID transfer water) combined with total costs being spread over a larger number of rate payers due to the expansion of the District's existing service area. The water gained through expansion (ECCID transfer water) compensates for the cost increase associated with Service Area E, bringing down overall unit costs. Unit costs for Service Area F are higher than those of Service Area E, despite the spreading of costs among a larger group of people, due to the increased quantity of transferred water required.

Resource Alternative 2. Alternative 2 reflects the second lowest cost among the alternatives-- $309 million for Service Area C. Exhibit F-10 displays the components including the cost for implementation of CPA 2 in 1997, with surface and spot water transfers making up the balance, out to the year 2040. The largest portion of this cost is from the inclusion of surface water transfers. Costs for Service Areas E and F are $352 million and $569 million, respectively, including the addition of ECCID water and increased quantities of water transfers.

-14 Unit costs for this Alternative are $187, $138 and $152 for Service Areas C, E and F, respectively. Again, the lowest per ac-ft cost is for Service Area E, largely due to the inexpensive ECCID transfer water gained with expansion of the District's service area.

Resource Alternative 3. Costs for Alternative 3 rose slightly above those of Resource Alternatives 1 and 2 due to the introduction of small scale reclamation. Costs for Alternative 3 are $339 million, $412 million and $628 million for Service Areas C, E and F, respectively. Exhibit F-11 illustrates the costs for Service Area C. This includes implementation of CPA 2 in 1997, with reclamation coming on-line in the year 2020, and surface and spot water transfers making up the balance, out to the year 2040. The small quantity of reclaimed water which CCCSD has started implementing is included beginning in 1997, at no cost to the District. The largest portion of the cost for this Alternative, as with Resource Alternatives 1 and 2, is from the inclusion of surface water transfers. Unit costs for this Alternative are $205, $162 and $167 for Service Areas C, E and F, respectively.

Resource Alternative 4. Resource Alternative 4 costs are the highest among all Resource Alternatives considered. Estimated costs are $831 million, $904 million, and $1,124 million for Service Areas C, E and F, respectively. Exhibit F-12 displays the breakdown of Present Worth costs for Service Area C, which includes the implementation of CPA 2 in 1997, combined with the maximum quantity of reclamation currently achievable within the District (30 TAF). The small quantity of reclaimed water which CCCSD has started implementing has been included beginning in 1997, and is included at no cost to the District. Reclamation projects are scheduled to come on-line for this Alternative in the year 2010, with additional projects in 2015 and 2018 to meet increasing

Exhibit F-9
Incremental Water Supply
Resource Alternative 1

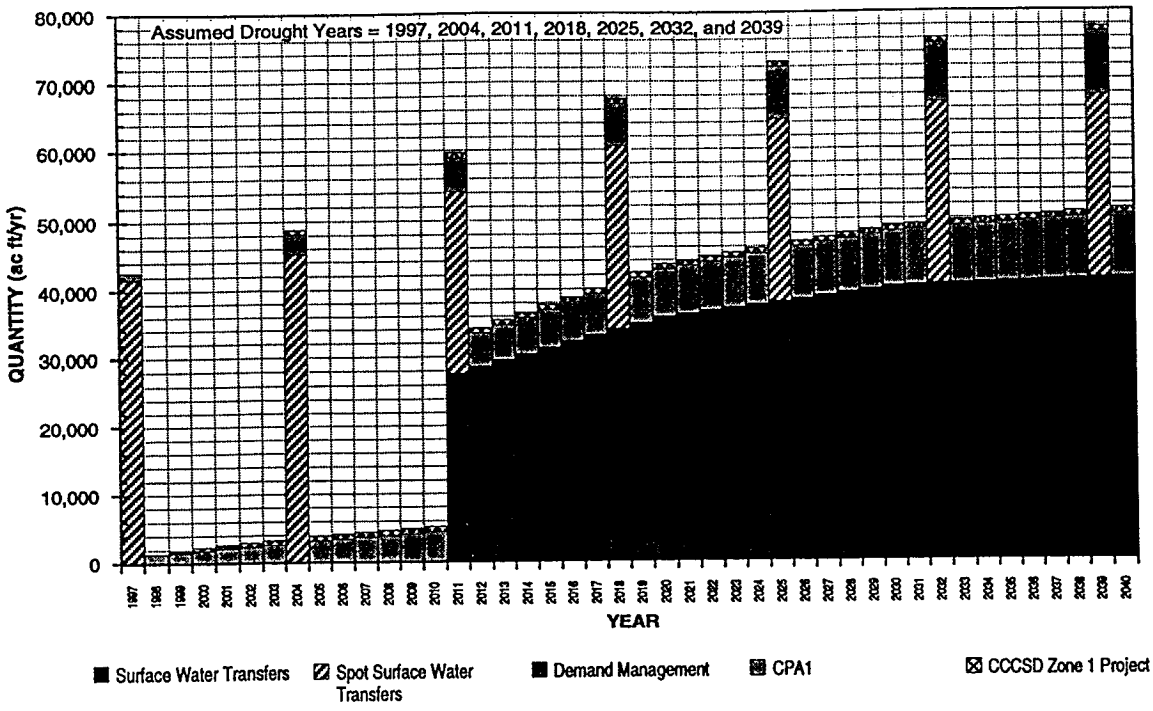


Exhibit F-10
Incremental Water Supply
Resource Alternative 2

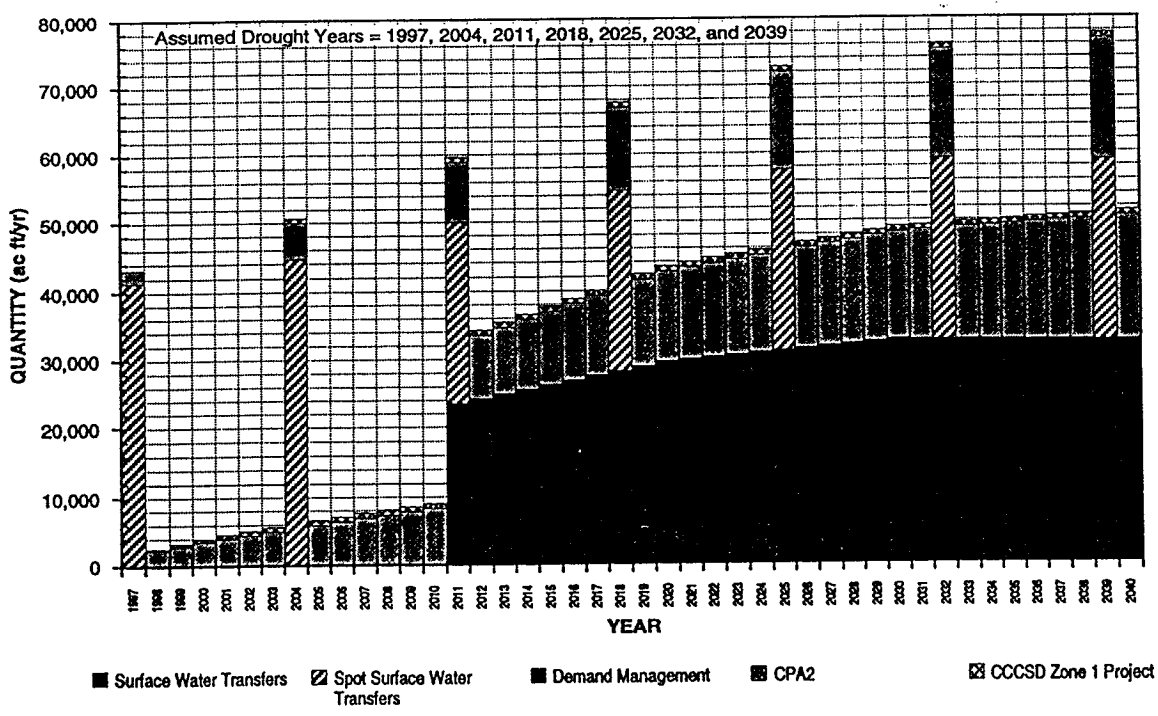
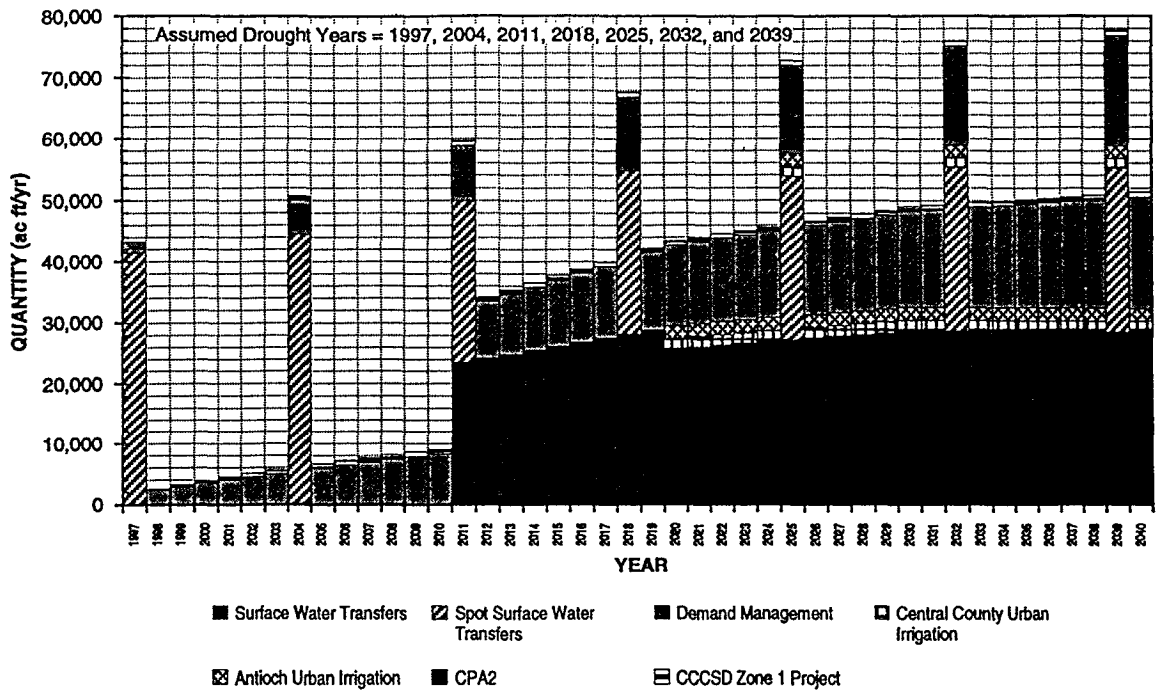
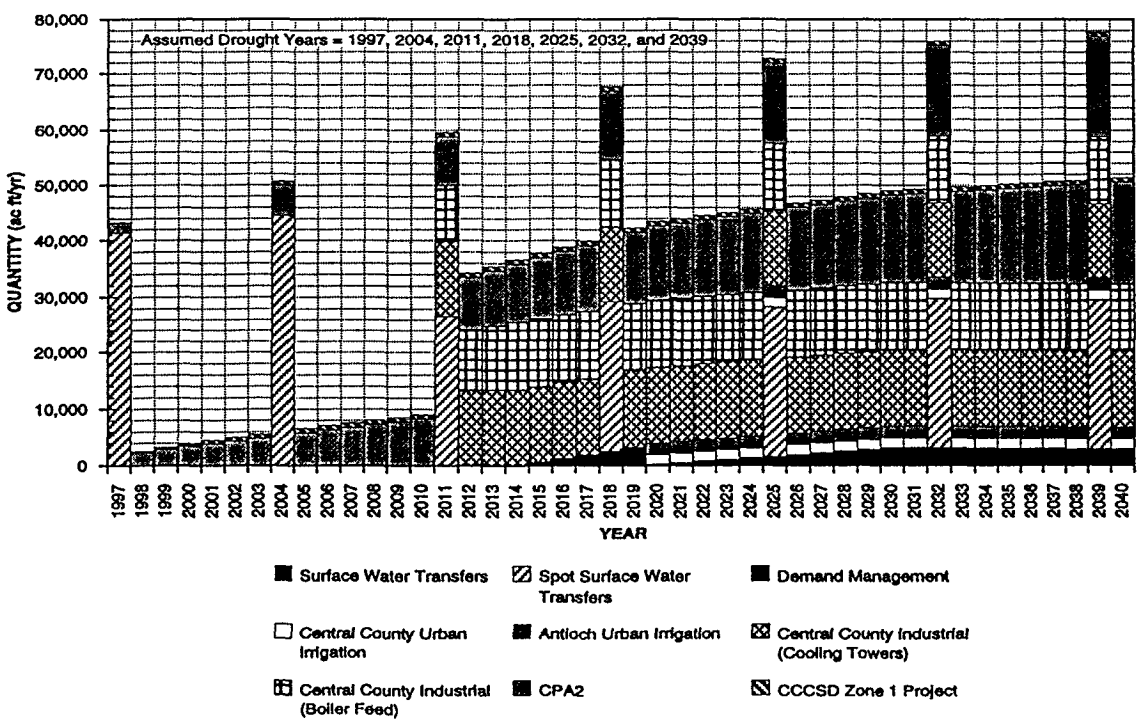


Exhibit F-11
Incremental Water Supply
Resource Alternative 3



-16

Exhibit F-12
Incremental Water Supply
Resource Alternative 4



Delivery Assumptions

Present Worth costs were projected for each Resource Alternative based on the additional needs required for *full* delivery of water in *all* years. For drought years, costs associated with meeting supply shortfalls were computed for two cases: (1) with no short-term demand management program, and (2) with a 15% short-term demand management program. Sensitivity runs were also conducted using varying levels of programs, discussed further in Chapter 7. For cost estimating and implementation schedule analyses, reductions in water supplies attributed to the CVPIA were assumed to occur in the year 2010.

Exhibit F-8 displays a graph representing the needs for additional water in normal and drought years. The sharp increase after the year 2010, in the graph, represents the anticipated reduction of CVP supplies from 195,000 ac-ft to 166,000 ac-ft during a normal year, and further reduction to 140,000 ac-ft during a drought. The graph represents those quantities which would still be needed during a drought, even if the District were to implement a reduced delivery system of 15% drought management.

The difference between meeting full delivery during a normal and drought year under projected demands would be 26,000 ac-ft. The potential for an earlier onset of a CVPIA reduction exists; based upon the District's perceptions, an earlier renewal of their contract may prove beneficial ~~to negotiations~~. At first glance, a preliminary examination of the District's existing contract shows that it may be in the District's interest to delay renewal, since the fine for later renewal (after approval of the PEIS) equates to approximately $18 per ac-ft, which might be less expensive than the cost of a supplemental water supply. For this reason, it may pay for the District to delay renewal until 2010; however, financial and water supply implications may prove it prudent to negotiate with the Bureau earlier.

Present Worth Costs

Present Worth costs were used to compare and rank the Resource Alternatives. Costs were developed based on implementation of each Resource Alternative in the year 1997 with supplies extending out to the year 2040. Costs were studied in most detail for Service Area C, but are also presented for the larger Service Areas E and F. The total cost for each Resource Alternative includes the purchase of spot surface water transfers during drought years, estimated to occur approximately every seven years.

Implementation and timing of projects is consistent throughout the Resource Alternatives. Conservation is implemented immediately, beginning in 1997. Reclamation would begin construction in 2007 at the earliest with water savings beginning by 2010 (for some Alternatives), when CVP supplies are reduced. In some cases reclamation is not implemented until 2017 with water savings beginning in the year 2020. Savings associated with Phase I of the Central County Urban Irrigation project, currently being implemented by CCCSD (Zone 1 Project), are shown beginning in 1997 with no Present Worth cost associated to the District. Surface water transfers would begin approximately in the year 2010, again, when supplies are reduced by the Bureau.

Operational costs include all annual expenses to the District as well as possible rate impacts to customers. Timing of projects, including environmental documentation, engineering design, environmental compliance and planning and construction of project components, were addressed through a timeline with 10-year intervals distributed over

demands. Surface water transfers would not be required to meet additional demand until approximately the year 2023.

The largest portion of the cost for this Resource Alternative ($394 million for Service Area C) is due to the inclusion of the boiler feed water component for two major industrial customers. This component's unit cost ($1,087) is almost five times that shown for surface water transfers ($198) and almost two times that of urban irrigation in Central County ($590-$631).

Total combined Unit costs for Service Area C are $503 per ac-ft, similarly, the highest of any Resource Alternative. Costs for Service Areas E and F are much lower ($355 per ac-ft and $299 per ac-ft, respectively) demonstrating the benefits of spreading costs over a larger service area. Even so, they are still over two times greater than the cost of the first three Resource Alternatives.

Resource Alternative 5. Resource Alternative 5 represents the lowest cost among the Resource Alternatives studied. Exhibit F-13 illustrates how early implementation of a conservation program designed to take advantage of a greater percentage of savings early on can reduce the cost of a Resource Alternative by reducing the need and cost of water transfers. The low cost associated with Resource Alternative 5 ($265 million for Service Area C) is due in large part to the economy of the higher level of accumulated savings over the Study period, combined with the reduced need for water transfers. Costs for Service Areas E and F are estimated at $305 million and $504 million, respectively. The larger accumulated savings associated with CPA 3, is due to the assumption that the program will achieve widespread early implementation, and increased penetration into the community each year, building upon the savings achieved from previous years. The result over the long-term is a large amount of savings, achieved at a relatively low cost compared to obtaining other additional supplies.

Unit costs for the Alternative were also the lowest, ranging from $155 to $118 to $ 134 per ac-ft, for Service Areas C, E, and F, respectively.

Resource Alternative 6. Resource Alternative 6 suggested, by the District's Board, to focus on high levels of conservation and reclamation, was studied in response to comments at the last Board workshop on August 9, 1995. Costs for Service Area C were $454 million with those for Service Areas E and F estimated at $535 million and $670 million, respectively. Exhibit F-14 illustrates the cost breakdown for Service Area C. This Resource Alternative was developed and studied to maximize reclamation and conservation, and have increased control over supplies. Resource Alternative 6 included two reclamation projects: Central County Urban Irrigation and Industrial Cooling Towers. Unfortunately, the combination of these relatively high cost reclamation projects dominated the effect on overall costs. The low cost of conservation was only capable of offsetting the high costs of the reclamation projects to a small degree. Unit costs for the Alternative were $266, $208, and $178 for Service Areas C, E and F, respectively.

COST EVALUATION OF THE ALTERNATIVES

Present Worth costs were calculated for each Resource Alternative using spreadsheets which arrayed the component and combined costs. The spreadsheets (not included in TA) summarized annual projected water deficits and water supply projects implemented

C-100369

Exhibit F-13
Incremental Water Supply
Resource Alternative 5

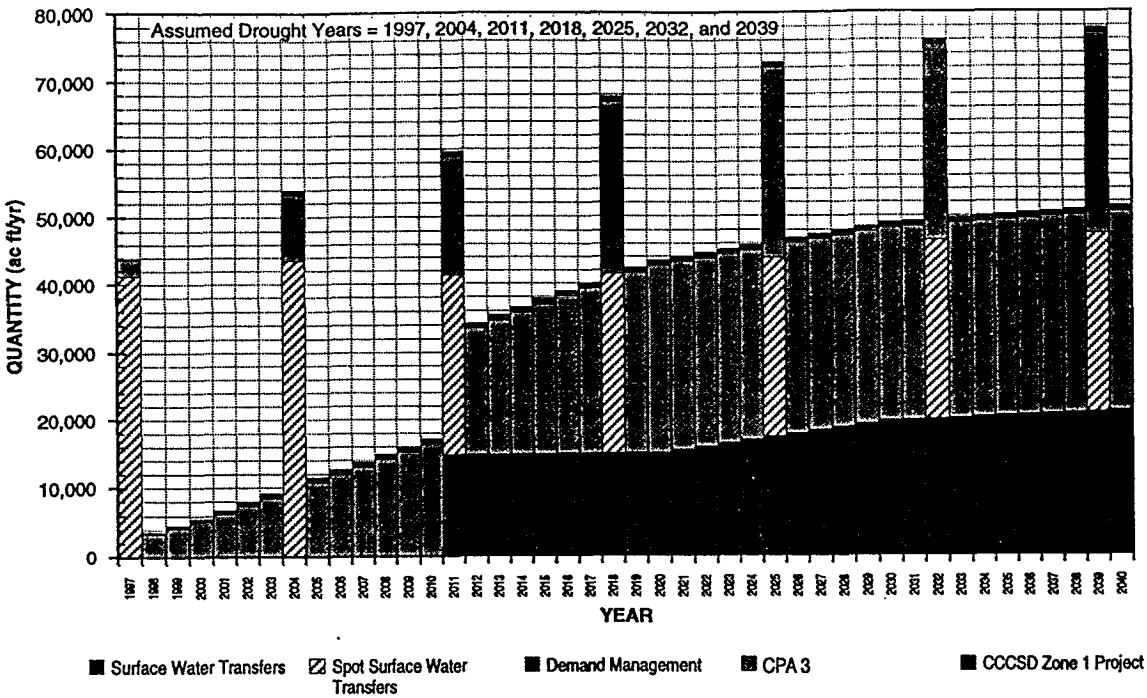
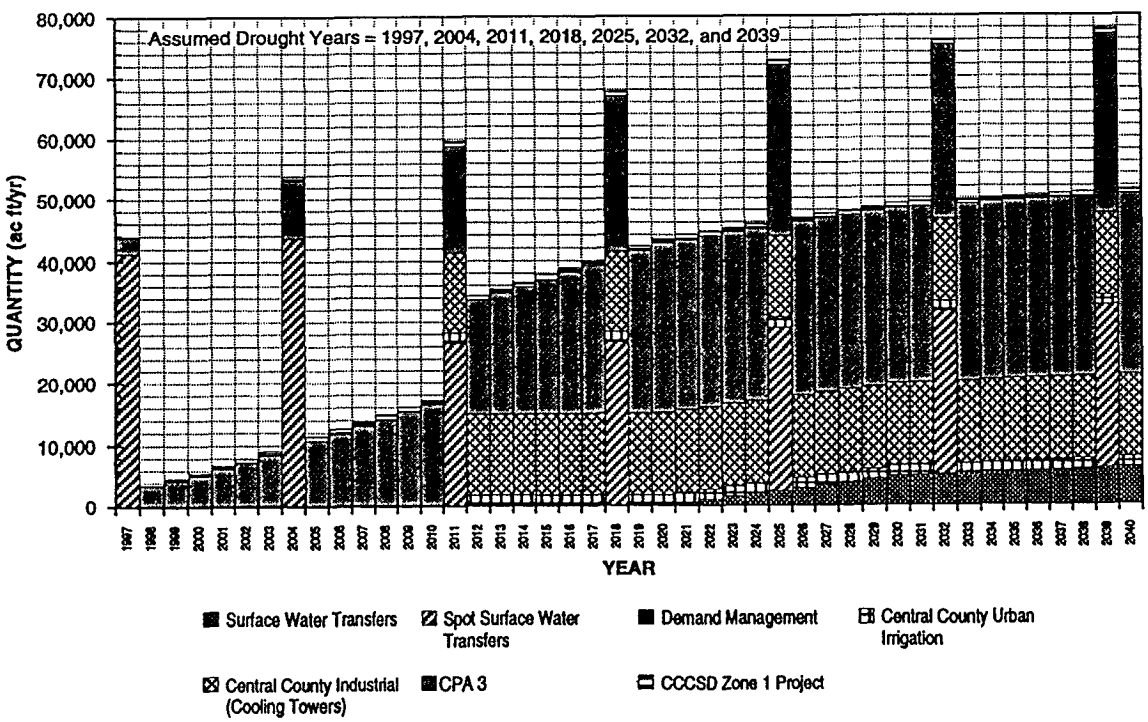


Exhibit F-14
Incremental Water Supply
Resource Alternative 6



to meet the deficits. Present Worth represents a common basis of comparison to account for differences in the composition of the Resource Alternatives and the phasing of individual components. In selecting the Resource Alternatives for further study no one determinant was used in selection.

Service Area C. Exhibit F-15 summarizes the Present Worth costs of the Resource Alternatives for Service Area C. The differences in water recycling Present Worth among the various Resource Alternatives are due to differences of when a project is brought on-line and/or annual recycled water deliveries. The latest any water recycling projects were brought on-line was 2020; some projects in some Resource Alternatives were brought on-line sooner to optimize surface water transfer quantities. In general, the Present Worth costs increase when a project is brought on-line sooner.

The total Present Worth cost is divided by the cumulative quantity of water obtained from the various Resource Alternative components to yield a normalized cost in $/ac-ft. Total and normalized Present Worth are presented two ways in the exhibit. First, all components other than CVP contract purchases are added together. This emphasizes the Present Worth cost of the components needed to meet the shortfall between gross water demands and CVP contract purchases. Second, all components including CVP contract purchases are added together. This emphasizes that CVP contract purchases represent a large portion of cumulative water demands over the planning period and are a relatively inexpensive water source; including CVP contract purchases in the calculations tends to smooth out Present Worth cost differences.

The exhibit highlights several key conclusions in evaluating the Present Worth costs of the six Resource Alternatives. First, increasing levels of conservation decrease the normalized cost of those Resource Alternatives composed of long-term conservation, surface water transfers, and spot surface water transfers only (i.e., Resource Alternatives 1, 2, and 5). Second, Resource Alternatives 4 and 6, with aggressive water recycling components, have significantly higher normalized costs than Resource Alternative 3.

Resource Alternatives 1, 2, 3 and 5 appear most promising based on the low Present Worth costs resulting from the Present Worth analysis. There appears to be only a minor range of difference in life-cycle costs among these four Resource Alternatives based on a Present Worth comparison. The high normalized cost of Resource Alternatives 4 and 6 were determined to be significantly higher than the other Alternatives, and therefore did not appear as promising as the other less costly Alternatives. In addition, due to the aggressive long-term conservation program (CPA 3) included within Resource Alternatives 5 and 6, these Alternatives did not appear promising due to concerns of potential demand hardening, lessened reliability, and difficulty in implementation. Therefore, Alternatives 4, 5 and 6 were not included in the further analysis of potential rate impacts.

Service Area E. Exhibit F-16 summarizes the Present Worth of those Resource Alternatives considered under Service Area E. The same general trends are shown in this exhibit as in Exhibit F-15. Similar to Service Area C, Resource Alternatives 1, 2 and 3 appear most promising. Because of the availability of surface water transfers from ECCID with Service Area E, there are no significant differences between the Resource Alternative components for Service Areas C and E; this implies that selecting a Resource Alternative now for Service Area C will not preclude future expansion of the service area.

CONTRA COSTA WATER DISTRICT
REQUEST FOR COPIES

DATE: 2/3/97 TIME: 8:00 am

NAME/DEPT.: Planning
NAME OF DOCUMENT: FWSS - Tech Appen B-F

PRIORITY
(Check One)

___ 1. SAME DAY - State time needed: _____
___ 2. NEXT DAY - Morning _____ or Afternoon _____
✓ 3. TWO DAYS - Date: _____

PRIORITIES WILL BE ACCOMMODATED AS NEARLY AS POSSIBLE. NOTIFICATION OF INABILITY TO ACCOMMODATE A PRIORITY WILL BE PROVIDED ON A TIMELY BASIS.

SPECIFICATIONS

1. No. of Copies: 10 Stapled: ___ YES ___ NO

2. Size: 8 1/2 x 11 ✓ 11 x 8 1/2 (wide) ___
8 1/2 x 14 ___ 11 x 17 ___

3. Paper: Plain ✓ 3-hole ___ Letterhead ___
Color: Blue ___ Goldenrod ___ Yellow ___
Green ___ Pink ___

4. Sides: 1 to 1 ___ 1 to 2 ___ 2 to 1 ___ 2 to 2 ✓

5. Miscellaneous: clear plastic cover w/ card stock white on back
Report Covers with Logo: YES ___ NO ___
(Heavy, Light Blue - Front Window, Solid Back)

Solid Cover: Green ___ Yellow ___ B lue ___ Grey ___
Solid Inserts: Green ___ Yellow ___ Blue ___ Grey ___

Reduce in size: ___ Enlarge to size: ___

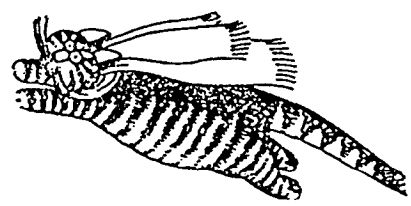
Tone: Normal ___ Lighter ___ Darker ___

6. TRANSPARENCIES: YES ___ NO ✓ (Frames no provided)
COLOR: Clear ___ Red ___ Blue ___ Green ___ Yellow ___

7. SPIRAL BINDING: YES ✓ NO ___
Wide Left Margin for Bindng Allowance

8. Computer Forms: YES ___ NO ✓

9. Labels: YES ___ NO ✓



C-100372

C-100372

Exhibit F-15
Service Area "C" Present Worth Costs Summary

	Resource Alternative						
	1	2	3	3a [1]	4	5	6
Components Except CVP Raw Water:							
Long-Term Conservation	$41,513	$56,121	$56,121	$56,121	$56,121	$86,329	$86,329
Water Recycling							
Central County Urban Irrigation	-	-	$22,349	$24,680	$22,349	-	$29,872
Antioch Urban Irrigation	-	-	$23,234	$25,755	$23,234	-	-
Central County Industrial Use (Cooling Towers)	-	-	-	$17,568	$249,289	-	$248,475
Central County Industrial Use (Boiler Feed)	-	-	-	-	$393,609	-	-
Surface Water Transfer	$219,969	$179,143	$163,358	$153,004	$12,607	$105,196	$16,191
Spot Surface Water Transfer	$74,659	$74,371	$74,371	$74,371	$74,371	$73,941	$73,941
Subtotal ($):	**$336,141**	**$309,635**	**$339,433**	**$351,499**	**$831,580**	**$265,466**	**$454,808**
Subtotal ($/af):	**$208**	**$187**	**$205**	**$213**	**$503**	**$155**	**$266**
All Components:							
CVP Contract	$278,251	$276,588	$276,588	$276,588	$276,588	$273,852	$273,852
Total ($):	**$614,392**	**$586,223**	**$616,021**	**$628,087**	**$1,108,168**	**$539,318**	**$728,660**
Total ($/af):	**$69**	**$66**	**$69**	**$71**	**$125**	**$61**	**$82**

All costs are in $1,000 except for unit cost, which is in $/af.
1 Resource Alternative 3 was advanced toward the end of the Round 2 analysis, resulting in Alternative 3a which increased urban irrigation from 5 to 6.7 TAF, in an attempt to provide greater drought reliability. Both Alternatives are shown for comparative purposes (for Service Area C only).

Exhibit F-16
Service Area "E" Present Worth Costs Summary

	Resource Alternative					
	1	2	3 [1]	4	5	6
Components Except CVP Raw Water:						
Long-Term Conservation	$48,645	$64,420	$64,420	$64,420	$103,245	$103,245
Water Recycling						
Central County Urban Irrigation	-	-	$23,108	$23,108	-	$22,349
Antioch Urban Irrigation	-	-	$71,996	$69,407	-	$69,542
Central County Industrial Use (Cooling Towers)	-	-	-	$249,289	-	$249,289
Central County Industrial Use (Boiler Feed)	-	-	-	$394,694	-	-
ECCID	$10,724	$10,016	$10,016	$10,016	$8,985	$8,848
Surface Water Transfer	$255,977	$209,239	$174,449	$24,613	$124,712	$14,284
Spot Surface Water Transfer	$68,672	$68,357	$68,357	$68,357	$67,881	$67,881
Subtotal ($):	**$384,018**	**$352,032**	**$412,346**	**$903,904**	**$304,823**	**$535,438**
Subtotal ($/af):	**$151**	**$138**	**$162**	**$355**	**$118**	**$208**
All Components:						
CVP Contract	$284,567	$283,792	$283,792	$283,792	$282,289	$282,289
Total ($):	**$668,585**	**$635,824**	**$696,138**	**$1,187,696**	**$587,112**	**$817,727**
Total ($/af):	**$67**	**$64**	**$70**	**$120**	**$59**	**$82**

All costs are in $1,000 except for unit cost, which is in $/af.
1 Resource Alternative 3 was advanced toward the end of the Round 2 analysis, resulting in Alternative 3a which increased urban irrigation from 5 to 6.7 TAF, in an attempt to provide greater drought reliability. See Exhibit F-15, Alternative 3a is approximately 3.5 percent higher than Alternative 3.

Service Area F. Exhibit F-17 summarizes the Present Worth costs of those Resource Alternatives considered under Service Area F. The same general trends are shown in this Exhibit and in Exhibits F-15 and F-16. Similar to Service Areas C and E, Resource Alternatives 1, 2 and 3 appear most promising. Although surface water transfers from ECCID are available with Service Area F, significant additional surface water transfers are necessary because of the higher demands associated with Service Area F. However, these differences will not preclude future expansion of the service area.

The exhibits presenting the Present Worth cost worksheets calculated for Alternatives 1 through 6 for Service Areas C, E and F have been attached at the back of this Technical Appendix. Each exhibit presents the components within each Alternative by calculating Present Worth costs and Unit costs for each and then a composite calculation for the entire Resource Alternative.

Cost vs. Implementation. Implementability can be a key factor in keeping down the costs of any proposed additional supplies. Potential impacts perceived to affect the environment and other communities can extend the time needed for environmental documentation, engineering design, environmental compliance, and construction of proposed facilities. In general, the greater the time and number of agencies involved, the higher the direct and indirect costs to implement such a project. Implementation of the three Resource Alternatives is not expected to be a major concern. As Resource Alternatives 1, 2, and 3 emphasize water transfers, implementability of the water transfer component will be key to their success. CPAs 1 and 2 are perceived as reasonable to implement, and the reclamation component within Resource Alternative 3 (6.7 TAF), although not expected to encounter many implementation hurdles, would not be implemented until the year 2019. The increased reclamation quantity shown for Alternative 3 (6.7 TAF), was developed and evaluated as the Round 2 analysis advanced, in an attempt to increase the reliability of the earlier Alternative 3. For the purposes of the final ranking of the three Resource Alternatives, that refined Alternative was used, however, both Alternatives 3 (5 TAF reclamation) and 3a (6.7 TAF) are shown in the previous exhibit for purposes of comparison (Exhibit F-15 for Service Area C). Transfers, although complex to negotiate due to the number of agency approvals required, have become more commonplace in the last five years. The establishment of the 1991 and 1992 drought water bank facilitated additional transfers. Any intricacies of negotiations, consideration of terms, or schedule of deliveries would be unique to each transfer. In the case of Resource Alternatives 1, 2, and 3, differences in costs due to implementation are not expected to be significant.

Cost vs. Reliability. Reliability was discussed in the Report in terms of technical reliability and evaluation through the criteria. The issue of cost as it relates to drought reliability was also discussed based on the relationship between conservation programs, additional drought management and the potential for avoided costs. The use of water banking has a significant positive effect on reliability and correspondingly increases costs. Conversely, a lack of reliability within a system can have significant costs to District customers.

Use of Banking to Increase Reliability. Water banking as a component of an overall long-range plan can expand flexibility and reliability of the District's supplies. Such benefits would also add to the District's incremental cost of obtaining additional supplies. Banking is not viewed as necessary for a near-term solution under Resource Alternatives 1, 2, and 3; however, decision points will be noted on the implementation timeline for con-

Exhibit F-17
Service Area "F" Present Worth Costs Summary

	Resource Alternative					
	1	2	3 [1]	4	5	6
Components Except CVP Raw Water:						
Long-Term Conservation	$53,039	$70,236	$70,236	$70,236	$112,000	$112,000
Water Recycling						
Central County Urban Irrigation	-	-	$22,349	$22,349	-	$22,349
Antioch Urban Irrigation	-	-	$69,542	$69,542	-	$69,542
Central County Industrial Use (Cooling Towers)	-	-	-	$249,289	-	$162,526
Central County Industrial Use (Boiler Feed)	-	-	-	$398,068	-	-
ECCID	$12,309	$11,926	$11,926	$11,926	$10,853	$10,853
Surface Water Transfer	$479,609	$420,453	$387,245	$235,400	$316,378	$227,731
Spot Surface Water Transfer	$68,008	$66,869	$66,869	$66,869	$64,983	$64,983
Subtotal ($):	$612,965	$569,484	$628,167	$1,123,679	$504,214	$669,984
Subtotal ($/af):	$163	$152	$167	$299	$134	$178
All Components:						
CVP Contract	$288,254	$287,829	$287,829	$287,829	$287,242	$287,242
Total ($):	$901,219	$857,313	$915,996	$1,411,508	$791,456	$957,226
Total ($/af):	$80	$76	$82	$126	$71	$85

All costs are in $1,000 except for unit cost, which is in $/af.

1 Resource Alternative 3 was advanced toward the end of the Round 2 analysis, resulting in Alternative 3a which increased urban irrigation from 5 to 6.7 TAF, in an attempt to provide greater drought reliability. See Exhibit F-15, Alternative 3a is approximately 3.5 percent higher than Alternative 3.

sideration and evaluation of a banking program in the future. As demand increases and the District purchases additional transfer water, banking will become a more practical option. It must be made clear that the Los Vaqueros Reservoir is not a banking program for the District; it was permitted for the specific purpose of improving water quality and increasing emergency storage.

An increase in banking would likely increase the cost of supplies. The District has a number of possibilities to consider in the future. Instead of purchasing supplemental water as a spot transfer, for example, another approach would be to purchase a long-term transfer or water entitlement and bank the water. The strategy would be to purchase a contracted quantity of water each year, store a portion of the water in a banking program during wet and normal years and then take advantage of the stored water during drought years. This would increase the reliability of any of the Resources Alternatives and correspondingly costs would also increase.

Implications of Unreliability. Lack of reliability within a system can result in a variety of implications depending on the District's reaction. The implementation of drought management necessitated by a shortage of supplies can bring about widespread indirect costs. Such economic considerations include the cost of the drought management program itself, as well as the temporary loss of jobs within the landscape sector, replacement of landscaping, loss of recreational opportunities, damage to fish and wildlife, and reduced sales to the District.

RATE IMPACTS

Rate impacts, were studied to evaluate the economic impact on the customer base and determine the most appropriate manner to spread costs for a long-term planning alternative among a broad customer base. Life-cycle costs were evaluated to rank the Resource Alternatives, whereas rate impacts were studied to gain a better understanding of the potential benefit of spreading costs across a larger service area, and determine how the cost of various Resource Alternatives will affect customer water bills.

Rate analysis was performed to determine the best method in which to implement the Preferred Alternative. Rate studies were undertaken to focus on the three Resource Alternatives which ranked best: Alternatives 1, 2, and 3. Rate impacts were analyzed based on a: 1) melded scenario (blended rate structure); 2) separate rate structure scenario (consistent with the District's current rate structure); and 3) emphasizing the cost of new hookups (raw water charges for new facilities). Rate increases to customers were addressed, focusing on the short- and mid-term, so the Board could compare the costs of getting each Resource Alternative underway in the year 1997.

Reclamation costs within Alternative 3 were studied in a number of ways including a sharing of costs among all beneficiaries of the recycled water. This would include residential customers which benefit through a freeing up of existing supplies; the sanitary district, which has their disposal quantities reduced; and the reclamation customer which will gain an increase in drought free supplies. Reclamation costs were examined more closely to evaluate the potential option of supplying 15% of the cooling tower demands of major industrial customers, in effect representing a "drought free" supply for those customers, which would be unaffected by cutbacks experienced within the District during drought years. This examination resulted in adjusting Resource Alternative 3 by increasing the quantity of recycled water from 5 TAF to 6.7 TAF. This resulted in a minor cost increase of 3.5% for the added increment of reliability from $339 million to $351 million.

Assumptions for the rate analysis followed existing District assumptions (based on the District's 95-96 10-year Rate Analysis) and those of the Present Worth analysis, as closely as possible. They include the following:

- Annual inflation rate of 4% (6.5% for water transfers) on O&M and capital costs.
- 30-year bond life for major capital at 6.5% interest rate.
- ECCID Present Worth cost of water: $20 per ac-ft.
- Present worth cost of surface water transfer: $175; spot water transfer: $300.
- CVP drought offset of $56 per ac-ft.
- Drought management costs of $500,000 per drought year calculated at 1 every 7.
- Facility construction is completed just prior to implementation (facility is constructed as required by demand).
- Drought management assumptions of 15% when CPA 1 is a component; 11% when CPA 2 is a component.
- Raw water charges for new facilities based on a 20% funding level per the current CIP assumptions.

Development of the rate model for the rate analysis focused on Service Area C. Once the model was finalized, the incremental costs of serving Service Areas E and F were

Exhibit F-18
Summary of Alternatives Before Preferred Alternative
Cost Per Acre Foot - Future & Constant 1996 Dollars

ALTERNATIVE		1996	2000	2010	2011	2020	2025	2030	2039	2040
10-Year CIP/	Future$	692	827	1034	1053	1263	1416	1596	2006	2059
Rate Analysis*	1996$	666	680	574	562	474	486	405	357	353
Alternative 1	Future$	692	838	1065	1078	1381	1856	1919	3216	2739
	1996$	666	689	591	680	518	572	486	573	469
Alternative 1A	Future$	692	838	1065	1348	1381	1889	1919	3130	2739
	1996$	666	689	591	720	518	582	486	557	469
Alternative 2	Future$	692	856	1101	1302	1408	1892	1944	3252	2745
	1996$	666	703	611	695	528	583	493	579	470
Alternative 2A	Future$	692	856	1101	1398	1408	1938	1944	3165	2745
	1996$	666	703	611	746	528	598	493	563	470
Alternative 3	Future$	692	856	1101	1302	1479	1766	2005	3299	2790
	1996$	666	703	611	695	555	524	508	587	478
Alternative 3A	Future$	692	856	1101	1398	1479	2019	2005	3224	2790
	1996$	666	703	611	746	555	623	508	574	478

* 10-Year CIP/Rate Analysis would not provide additional water required in drought years or after the CVP reductions.

Note: Example drought years are assumed for 2011, 2025, and 2039.

determined. It appears that the cost of serving Service Area E could actually be less than serving Service Area C. This rate reduction is partly based on the ability to spread costs among a larger population, but largely due to the inexpensive water supply which would be brought into the District with an expansion into Service Area E.

Findings from Initial Analysis

The rate analysis was performed in two ways for each of the three Resource Alternatives. The first assumed no drought management, supplementing supplies with spot surface water transfers (1, 2 and 3). The second assumed a level of drought management, either 11% or 15%, for implementation in drought years (1A, 2A and 3A). Reduced sales to the District have some minor implications here. The results of both are shown in Exhibit F-18.

Findings from the rate analysis for the Resource Alternatives include:

1. Through 2010, the only difference among the alternatives is that Alternative 2 and Alternative 3 include CPA 2. In 2010 the cost per ac-ft difference between Alternative 1 and Alternative 2 (which is the difference between CPA 1 and CPA 2) is $36/ac-ft in future dollars, $20/ac-ft in 1996 dollars. In 2040 the difference is only $6/ac-ft in future dollars, $ 1/ac-ft in 1996 dollars. The diminishing difference reflects three elements: lower surface water transfers with CPA 2, lower demand resulting from greater conservation, and higher cost for the CPA 2 program. The net effect of the two conservation programs is trivial expressed in cost per ac-ft.

2. The cost per ac-ft with drought management in drought years is higher than without drought management. Three factors contribute to this result: 1) drought management promotion and implementation costs, set at $500,000 plus inflation of 4 percent, 2) lower volume by 11 or 15 percent that reduces the denominator in calculating the cost per unit (fixed costs of production do not decline with decreases in volume), and 3) partially offsetting the cost increases, costs are reduced by not having to buy spot water transfers.

   The unit cost with drought management, in drought years, actually increases in 2011 by $40/ac-ft ($720-$680) with CPA 1 and by $51/ac-ft ($746-$695) with CPA 2. By 2039, the unit cost with drought management in drought years decreases as the cost savings from reduced spot transfers increases with the assumed 6.5 percent inflation rate.

3. All of the alternative sources of additional supply are more costly than the current costs because the current cost of CVP water is very favorable. In 2020 the increase in cost is between $118 and $216/ac-ft in future dollars, and $44 and $81/ac-ft in 1996 dollars. In 2040, the increase in cost is between $680 and $731/ac-ft in future dollars and $116 and $125/ac-ft in 1996 dollars. The nominal increase in real cost is due primarily to the fact the entire incremental cost is for only about 30,000 ac-ft of additional supply, about 17 percent of total demand. In addition, water transfers have been estimated at the high end of current market prices, as a conservative approach, and would likely be somewhat lower, On a melded cost basis, the high cost of incremental supply is substantially diluted by the 83 percent of base level cost. The bottom line of the analysis of these three Resource Alternatives is that, using a melded cost approach in future or 1996 dollars, there is little difference among them and that any one, or combination of Alternatives, could be selected as a preferred alternative without unduly affecting water rates.

Comments on the Preferred Alternative

The Preferred Alternative was developed after review meetings with the Customer Feedback Group and the Board of Directors and has been summarized in Exhibit F-19. It includes the implementation of conservation (CPA 1) in 1997, and the simultaneous pursuit of at least six transfer sources as soon as practical. Drought year demand is met by the purchase of water rights, in perpetuity, to meet CVP cutbacks in supply in any number of years, not just 1 year in 7. The Preferred Alternative leaves open future opportunities to increase conservation and pursue reclamation projects, depending on the success of the components. Although the near-term Action Plan currently resembles Resource Alternative 1, in the future the plan may grow to resemble Resource Alternative 2 or 3 if periodic updates of the Study reveal the need to implement additional components. For this reason, the reclamation projects as discussed within Resource Alternative 3a, have been included within the analysis presented in Exhibit F-19.

1. The years used in the table are either milestone years (1996, 2000, 2010, 2020, 2030, 2040) or every other of the 1 in 7 drought years (2011, 2025, 2039), included to show the effect of drought years on costs.

2. Water sales in thousands of ac-ft are shown just below the years to add some perspective to the cost per ac-ft numbers. Water sales increase 81.8 percent over the 44 years, a compounded annual rate of 1.37 percent. These numbers are based upon the District's 10-year Rate Analysis. Such numbers will be subject to annual re-

view and updating. A review and update of the FWSS will also occur approximately every five years.

3. Costs per ac-ft for the current 10-Year Rate Analysis are shown as a base case, with volumes through 2006 and 0.6 percent annual growth thereafter. Costs in future dollars increase at an average annual rate of only 2.5 percent, which is a composite of 4 percent for O&M expenditures and 0 percent for debt service once it is in place. For this projection of existing conditions, debt service will decrease from 43 percent of total revenues in 2000, to 26 percent in 2020, and to 13 percent in 2040. The declining percentage is not due to reduced debt service but rather to constant debt service while other costs, and the revenues to support them, increase.

4. Constant (1996) dollar costs per ac-ft projected for the District's 10-Year Rate Analysis decrease substantially because only the O&M costs are increasing with inflation while the 4 percent deflator is applied to all costs (including the constant debt service). This deflating of water bills to 1996 dollars at 4 percent implies that rate payers incomes will increase at the inflation rate. If rate payers' (the composite rate) incomes increase at only 2.5 percent per year, the real water bill in 2040 would be no higher than the current bill.

5. Below the District's 10-Year Rate Analysis costs are the incremental cost categories that relate to meeting long-run demand. CPA 1 will reduce consumption by 910 ac-ft in 1997, growing to 6,880 ac-ft by 2040. Conservation is effectively an increase in supply and avoids pursuit of a more costly source of supply. The unit cost of conservation is unique in that the money spent each year has a cumulative effect on water use. For example, a toilet retrofit in year one continues to save water in years 5, 10, and 20. Consequently, although the unit cost is relatively high in the early years ($915/ac-ft in 2000), the average cost per year decreases steadily until, in 2040, it is $767/ac-ft ($131/ac-ft in 1996 dollars). Conservation requires a large dollar expenditure over time ($174 million through 2040 in future dollars, $62 million in 1996 dollars), but provides water at a lower cost in both future and 1996 dollars than any other source of supply.

6. The second cluster of additional costs is the cost of expanded volume. The District's current 10-Year Rate Analysis is constructed around recent account growth rates and operating costs. The projected plan extrapolates those same rates. District water demand through 2040 is expected to increase substantially (1.37 percent per year compared to 0.6 percent in the District's 10-Year Rate Analysis). The costs to convey, treat, and distribute the additional demand is estimated at the average operating cost per ac-ft contained in the Rate Analysis. This simple approach is used because the FWSS does not include an analysis of operating costs or costs for conveyance facilities which could provide detailed cost estimates. Operating costs include a large portion of fixed costs which will not increase with volume; consequently, the costs of expanded volume could be somewhat overstated in the early years. However, the inclusion of fixed costs compensates for additional facility costs that will be required in later years as the expanded volume exceeds the capacity of existing facilities. Non-operating costs for expanded volumes, such as revenue funded capital and debt service, are included separately in the overall cost analysis. Operating costs per ac-ft increase from $716/ac-ft in 2010 (expanded volume begins in 2007) to $1,781/ac-ft in 2040 but decreases in 1996 dollars from $398 to $305/ac-ft for the same years. The decrease in 1996 dollar cost results from the increase in future dollar cost of 3.1 percent (made up of a 4 percent increase in

Exhibit F-19
Summary of the Preferred Alternative
Cost Per Ac-ft - Future & Constant 1996 Dollars

PROGRAM		1996	2000	2010	2011	2020	2025	2030	2039	2040
Water Sales (thousands of ac-ft)		106.8	113.2	144.1	150.8	188.7	190.8	193.0	194.1	194.2
10-Year CIP/ Rate Analysis	Future$	692	827	1034	1053	1263	1416	1596	2006	2059
	1996 $	666	680	574	562	474	436	405	357	353
CPA 1	Future$		915	611	607	616	650	686	758	767
	1996$		752	339	324	231	200	174	135	131
Expanded Volume	Future$			716	736	953	1114	303	1727	1781
	1996 $			398	393	357	343	330	307	305
Water Transfers										
Total Water Transfers	Future$					845	1158	1586	2795	2977
	1996$					317	357	402	498	510
Raw Water Facilities Rate Transfers	Future$					169	232	317	559	595
	1996 $					63	71	80	100	102
Rate Funded Transfers	Future$					676	926	1269	2236	2382
	1996 $					254	286	322	398	408
Reclamation										
Total Reclamation Programs	Future$					2896	3150	3458	4190	4288
	1996$					1086	971	876	746	734
Capital funded 100% from Raw Water Facilities Rate of Capital	Future$					1728	1728	1728	1728	1728
	1996 $					648	533	438	308	296
Rate Funded (O&M) Reclamation	Future$					1168	1422	1730	2462	2560
	1996 $					438	438	438	438	438
TOTAL	Future$	692	856	1045	1052	1348	1584	1831	2521	2543
	1996$	666	704	580	561	506	488	464	449	435

O&M costs partially offset by the District's Rate Analysis 0.7 percent increase in water sales) which is deflated by a 4 percent inflation rate to get 1996 dollars.

7. The next element of incremental costs is the cost of water transfers. The amount of water transfers required in each year is derived as the difference between total projected water sales and all sources of water other than transfers. The unit cost has been estimated at $175 in 1995 dollars with a 6.5 percent cost escalation applied to

reflect the increasing shortage of water. This cost includes only the purchase cost of the water and conveyance to District facilities; the cost of treatment and distribution is included in the cost of expanded volume. This cost is a conservative estimate and represents the high end of the range examined, actuals costs would likely be less. In early years, water transfers are a relatively low cost source of water at the projected market prices, but as the prices continue to escalate at 6.5 percent per year, transfers become a very expensive water source.

It is currently estimated that 20 percent of the cost of water transfers will be funded from the rates for new raw water facilities; therefore, the net cost to existing rate payers will (in 1996 dollars) range from $254 to $408/ac-ft between 2020 to 2040. The ideal would be to lock-in to an assured source of transfer supply for a fixed sum so that water supply costs do not vary with market conditions as water supplies become more and more scarce.

8. The final source of incremental supply is from the three reclamation projects included in Resource Alternative 3a, which could eventually become a component within the District's Action Plan if periodic updates of the FWSS reveal the need to implement additional components. These are the most costly sources of supply remaining in the FWSS. Their implementation will depend on results of the five-year updates as to the best remaining alternatives. The capital portions of the reclamation programs are expensive in their early years because of the large capital expenditures for facilities; however, the debt service on the capital is a fixed cost which results in consistently decreasing real cost over time.

   In any case, 100 percent of the reclamation capital is assumed to be funded from the rates for new raw water facilities, with no impact on water rates because it is a supply needed only for growth in demand. If this percentage were to be reduced, an increase would likely occur. The O&M portion of the reclamation programs is funded from water rates and remains the same in 1996 dollars because the costs are escalated at the same 4 percent as the deflator. The rate funded portion of the reclamation programs is about the same as for water transfers (which continue to escalate at 6.5 percent) by 2040. With reclamation programs, there is a strong possibility of selling the water without further processing, which would be the case for only a small portion of the water transfers. The economics of prices, conveyance, treatment, and distribution costs for the reclamation programs and other programs addressed elsewhere will be evaluated in the five-year updates. Discussion of facilities for such projects has also been addressed within the Draft Reports for the Seismic Reliability Improvement Project and the East County Phase II Studies.

Cost of Water for Drought Conditions

The FWSS assumes that a drought will occur once every seven years. The study also recognizes that drought conditions can occur anytime and can last much longer than one year. Several methods of meeting the CVP cutback of 15 percent of historical purchases or 25 percent of contracted supply were evaluated:

1. In a short-term drought situation, it seems reasonable to simply engage a drought management program to cut demand by the amount of supply cutback. The difficulty with this solution is that the severity and duration of a drought cannot be predicted. In a worst case situation, District customers would be subjected to restrictions and conditions that the Customer Feedback Group and the Board of Di-

rectors deemed unacceptable in response to earlier FWSS presentations and discussions. Moreover, as pointed out previously, a drought management program is not a low cost solution due to the implementation costs and the necessarily higher water rates that are required to pay for the fixed costs of water production, treatment, and distribution while selling lower volumes.

2. Another method of meeting and financing drought demand is to impose a surcharge on all water sales during the period of supply cutback. The surcharge for a 15 percent cutback would be about 20 percent of existing water bills. This solution was rejected because of the severity and unpredictability of the program.

3. A third method of financing drought water purchases is to impose a modest surcharge on water sales to build cash reserves in normal years for use in drought years. This program was rejected largely because of the unpredictability of drought occurrences. It is conceivable to not have a drought for 20 years, which could lead to excessive reserves, or to have droughts more frequently than expected, which would lead to inadequate reserves.

4. The solution selected is to buy water rights for all years to meet the CVP cutbacks. When the water is needed, it will be available; when it is not needed, it will be sold at market prices, estimated to be $50 in 1996 (increasing with inflation), or be used for mitigation purposes. This strategy was selected from an analysis of four purchase option methods, as shown in Exhibit F-20.

Exhibit F-20
Comparison of Cost/ac-ft and Total Investment for Purchase Options

Purchase Option	Type of Cost	2010	2020	2030	2040
Method 1	$/ac-ft	1,000	1,000	1,000	1,000
	NPV $ mils	22.7	15.2	3.0	-7.9
Method 2	$/ac-ft	765	1,008	1,657	1,990
	NPV $ mils	10.2	25.2	33.3	49.7
Method 3	$/ac-ft	1,184	1,721	2,586	3,613
	NPV $ mils	12.1	26.0	39.9	56.1
Method 4	$/ac-ft	1,034	1,880	2,793	3,832
	NPV $ mils	22.7	47.0	69.8	96.0

Key Elements of Financing Methods

Purchase Option Method 1: Purchase outright of water rights for all years at the current market price of $1,000/ac-ft, or $25 million for the maximum cutback of 25,000 ac-ft. The present value of benefits for this option exceeds that for the costs by 2040 due to the sale of unused water.

This option provides the lowest (long-run) cost per ac-ft because the water rights are purchased at the current market price, which is less than the long-run benefit to the District. The long-run benefit to the District was calculated as the sum of the net present values of the purchases of water to meet drought cutbacks for all years ($96 million) or for 1 year in 7 ($49.7 million). Unneeded water in normal years is sold at an estimated market price for secondary water of $50/ac-ft (escalated for inflation) which results in the present value of benefits exceeding costs by 2040.

- Since the purchase of water rights is assumed to be made in the current 10-Year Rate Analysis period with rights in perpetuity, there is no escalation of costs over time.
- The favorable income effect from selling water in normal years results in the lowest revenue requirement (melded cost) for this option. It should be pursued as soon as practicable.

Purchase Option Method 2: Purchase water rights for each 1 year in 7 drought event as it occurs, at the spot market price of $300/ac-ft plus inflation, which would result in a total NPV of $49.7 million if the rights are purchased through 2040. (Estimates of $175 and $300 were used here and in the Report for methods 2, 3 and 4. $125 and $250 were used for water purchased with $40-$50 added in O&M, pumping and restoration charges.)

- This option has the intuitive appeal of buying water only for the years needed. The purchase price is assumed to be adequate to strike a purchase agreement that would provide water for an average of 1 year in 7 so that the water needs of a drought that persists over several years would be available.
- The costs for this option escalate over time because the length of the agreement is being extended. A contract to provide water in perpetuity would be preferable.

Purchase Option Method 3: Purchase water rights for all years, at the transfer price of $175/ac-ft/yr, based on purchases to replace an 8 percent drought cutback, with the other 7 percent of the shortage met through drought management programs (total NPV of $56.1 million for rights through 2040).

- The cost for this option is higher than for method 1 because it provides that drought requirements be purchased for all years while the need is expected to be 1 year in 7. The amount of water needed is about the amount that would be needed without the drought management program, but the cost per ac-ft is similar.
- The costs for this option escalate over time because the length of the agreement is being extended. A contract to provide water in perpetuity would be preferable.

Purchase Option Method 4: Purchase of water rights for all years at the transfer price of $175/ac-ft/yr plus inflation, which equates to a NPV of $96 million through 2040.

- This option is the most expensive of the options in cost/ac-ft and total commitment because it assumes that the price paid is the NPV of the drought water purchases for all years. The actual market price is expected to be considerably lower than the total NPV (as in Method 1), which is the normal basis for a win-win exchange.

Conclusions

There are numerous findings and inferences that can be extracted from the rate impact analyses that were conducted. Many have been stated in the foregoing text. The fol-

lowing discussion is a summary of the major findings and conclusions that resulted from the economic and rate impact analysis.

- The cost of incremental supply for any one of the new sources of supply is substantial compared to existing CVP water, which is purchased for about $56 per ac-ft. For example in 2040, the CPA 1 cost is $767/ac-ft ($131/ac-ft in 1996 dollars); the cost of water transfers is $2,977/ac-ft ($510/ac-ft in 1996 dollars); and the cost of reclamation water is $4,288/ac-ft ($734/ac-ft in 1996 dollars). While these incremental costs are high, the impact on the typical customer's water bill will be less for two major reasons:
  - The District's policy of having growth pay for growth assigns the cost of conservation programs and water transfers to the rate for new raw water facilities, along with the capital cost of reclamation programs developed to accommodate growth. This assumes reclamation is phased in on schedule. This substantially reduces the costs that must be paid through water rates.
  - Costs of the new supplies that are funded from water rates are melded into total cost so that the average cost per unit of water is diluted by the lower costs of the base volume, which makes up 83 percent of total volume.
- Ongoing rate revenue requirements are moderated by the fact that current debt service, which does not escalate with inflation, makes up 43 percent of total expenditures. Consequently, as O&M costs increase with inflation at 4 percent, with the debt service constant, the average rate increase for non-capital costs will be something less than 4 percent.
- The major capital programs that must be funded from water rate revenue are the seismic program, which is scheduled to end in 2003, and a portion of the FWSS. The largest FWSS expenditure is to purchase water rights for drought years. Since these costs are already built into the 10-Year Rate Analysis, the FWSS does not have a large incremental impact on water rates.

INDIRECT COSTS

The evaluation of indirect costs was based on the potential economic impacts of the six Resource Alternatives on customers in terms of overall job gains or losses in the local and regional economy, increases or decreases in the diversity of economic sectors, and increases or decreases in the health of economic sectors including agriculture.

Resource Alternatives that include reclamation typically rated slightly higher based on the expected slight increase in jobs due to construction and operation of local facilities. New supply was expected to have minimal indirect impacts on the economy within the District. A large transfer could have a potential impact on the region from which it is transferred; however, it was assumed for this evaluation that the negotiation, approval and permitting process through the State would be sufficient to safeguard any such impacts which the District could not mitigate for. Conservation at lower levels was expected to have minimal to no impact on the District. However, CPA 3 (the most stringent program) rated lower based on the potential reductions to jobs in landscaping, nursery, and maintenance industries, as well as perhaps recreation and aesthetics. Exhibit F-21 displays the ratings for indirect impacts the Resource Alternatives would have on the economy within the District, based on professional judgement.

Exhibit F-21
Evaluation of Indirect Economic Impacts

Alternative	1	2	3	4	5	6
Rating:	M+	M+	M	H-	M-	M

CONCLUSION

Evaluation of the six Resource Alternatives based on economic analysis revealed Resource Alternatives 1, 2, 3 and 5 as the most cost effective in terms of the Present Worth Analysis; however, Resource Alternative 5 was removed from further analysis based on low scores for reliability and implementability. The rate analysis performed on the three remaining Resource Alternatives (1, 2, 3) revealed there would be little difference among the three, and that any of them could be selected without unduly affecting water rates as compared to the current 10-Year Rate Analysis. Alternative 1 was found to have less expensive near-term costs (year 2000) and increased savings could potentially be achieved through implementation of CPA 1 without the additional funding required by CPA 2, depending on the design and success of the program. Indirect costs among the three remaining Alternatives resulted in very minor differences.

Although the bulk of the analysis was directed at Service Area C, it was determined that the same general trends among the Resource Alternatives hold for Service Areas E and F, therefore selecting a Resource Alternative now for Service Area C would not preclude future expansion of the service area.

ATTACHMENT 1

- Service Area C Present Worth Spreadsheets
- Service Area E Present Worth Spreadsheets
- Service Area F Present Worth Spreadsheets

Service Area "C" Resource Alternative 1 Present Worth

C-100387

Year	Gross Demand (AF/yr)	Conservation Program 1: Quantity (AF/yr)	Conservation Program 1: Escalated Capital Cost	Conservation Program 1: Escalated O&M Cost	Conservation Program 1: Total Present Worth Cost	CCCSD Zone 1 Project: Quantity (AF/yr)	Historical Demand (AF/yr) [b]	Normal Year: CVP Contract (AF/yr) [c]	Normal Year: Net Deficit (AF/yr)	Drought Year (Cutback: 25%): CVP Contract (AF/yr) [d]	Drought Year: Net Deficit (AF/yr)	CVP Raw Water Allocation [c]: Quantity (AF/yr)	CVP Raw Water Allocation: Escalated Capital Cost	CVP Raw Water Allocation: Escalated O&M Cost	CVP Raw Water Allocation: Total Present Worth Cost
		Capital Cost (1995): - ; O&M Cost (1995): -										Capital Cost (1995): - ; O&M Cost (1995): $56			
1997	167,700	910		$741,000	$741,000	125	166,665	195,000	0	124,999	41,666	124,999		$7,571,124	$7,571,124
1998	170,333	1,213		$1,027,000	$964,319	249	168,871	195,000	0	126,654	-	168,871		$10,637,608	$9,988,364
1999	172,967	1,517		$1,336,000	$1,177,897	374	171,076	195,000	0	128,307	-	171,076		$11,207,523	$9,881,216
2000	175,600	1,820		$1,667,000	$1,380,024	498	173,282	195,000	0	129,962	-	173,282		$11,806,147	$9,773,708
2001	177,840	2,073		$1,747,000	$1,357,983	623	175,144	195,000	0	131,358	-	175,144		$12,410,330	$9,646,836
2002	180,080	2,326		$1,832,000	$1,337,142	664	177,090	195,000	0	132,818	-	177,090		$13,050,148	$9,525,053
2003	182,320	2,579		$1,920,000	$1,315,842	706	179,035	195,000	0	134,276	-	179,035		$13,721,219	$9,403,619
2004	184,560	2,832		$2,013,000	$1,295,378	747	180,981	195,000	0	135,736	45,245	135,736		$10,818,881	$6,962,017
2005	186,800	3,085		$2,109,000	$1,274,324	789	182,926	195,000	0	137,195	-	182,926		$15,163,409	$9,162,205
2006	189,040	3,338		$2,211,000	$1,254,418	830	184,872	195,000	0	138,654	-	184,872		$15,937,709	$9,042,311
2007	191,280	3,591		$2,317,000	$1,234,326	830	186,859	195,000	0	140,144	-	186,859		$16,753,368	$8,924,955
2008	193,520	3,844		$2,428,000	$1,214,515	830	188,846	195,000	0	141,635	-	188,846		$17,608,778	$8,808,126
2009	195,760	4,097		$2,544,000	$1,194,873	830	190,833	195,000	0	143,125	-	190,833		$18,505,817	$8,691,865
2010	198,000	4,350		$2,665,000	$1,175,310	830	192,820	195,000	0	144,615	-	192,820		$19,446,444	$8,576,208
2011	199,150	4,603		$2,783,000	$1,156,582	830	193,717	166,000	27,717	139,500	54,217	139,500		$14,631,729	$6,059,003
2012	200,300	4,856		$2,926,000	$1,137,706	830	194,614	166,000	28,614	139,500	-	166,000		$18,107,683	$7,040,747
2013	201,450	5,109		$3,065,000	$1,119,017	830	195,511	166,000	29,511	139,500	-	166,000		$18,831,990	$6,875,472
2014	202,600	5,362		$3,211,000	$1,100,771	830	196,408	166,000	30,408	139,500	-	166,000		$19,585,270	$6,714,076
2015	203,750	5,615		$3,363,000	$1,082,515	830	197,305	166,000	31,305	139,500	-	166,000		$20,368,681	$6,556,468
2016	204,900	5,868		$3,523,000	$1,064,805	830	198,202	166,000	32,202	139,500	-	166,000		$21,183,428	$6,402,561
2017	206,050	6,121		$3,690,000	$1,047,211	830	199,099	166,000	33,099	139,500	-	166,000		$22,030,765	$6,252,266
2018	207,200	6,374		[illegible]	[illegible]	830	[illegible]	166,000	[illegible]	139,500	[illegible]	139,500		$19,254,358	[illegible]
2019	208,350	6,627		$4,047,000	$1,012,609	830	200,893	166,000	34,893	139,500	-	166,000		$23,828,476	$5,962,177
2020	209,500	6,880		$4,239,000	$995,915	830	201,790	166,000	35,790	139,500	-	166,000		$24,781,615	$5,822,220
2021	210,060	6,997		$4,356,000	$960,942	830	202,233	166,000	36,233	139,500	-	166,000		$25,772,879	$5,685,548
2022	210,620	7,114		$4,475,000	$928,943	830	202,676	166,000	36,676	139,500	-	166,000		$26,803,794	$5,552,085
2023	211,180	7,231		$4,597,000	$894,097	830	203,119	166,000	37,119	139,500	-	166,000		$27,875,946	$5,421,754
2024	211,740	7,348		$4,722,000	$862,356	830	203,562	166,000	37,562	139,500	-	166,000		$28,990,984	$5,294,483
2025	212,300	7,465		$4,849,000	$831,502	830	204,005	166,000	38,005	139,500	64,505	139,500		$25,537,421	$4,344,836
2026	212,860	7,582		$4,979,000	$801,685	830	204,448	166,000	38,448	139,500	-	166,000		$31,356,648	$5,048,833
2027	213,420	7,699		$5,111,000	$772,712	830	204,891	166,000	38,891	139,500	-	166,000		$32,610,914	$4,930,316
2028	213,980	7,816		$5,246,000	$744,716	830	205,334	166,000	39,334	139,500	-	166,000		$33,915,351	$4,814,581
2029	214,540	7,933		$5,384,000	$717,658	830	205,777	166,000	39,777	139,500	-	166,000		$35,271,965	$4,701,562
2030	215,100	8,050		$5,525,000	$691,505	830	206,220	166,000	40,220	139,500	-	166,000		$36,682,843	$4,591,197
2031	215,330	8,167		$5,668,000	$666,106	830	206,333	166,000	40,333	139,500	-	166,000		$38,150,157	$4,483,422
2032	215,560	8,284		$5,813,000	$641,452	830	206,446	166,000	40,446	139,500	66,946	139,500		$33,342,318	$3,679,262
2033	215,790	8,401		$5,961,000	$617,637	830	206,559	166,000	40,559	139,500	-	166,000		$41,263,210	$4,275,404
2034	216,020	8,518		$6,112,000	$594,631	830	206,672	166,000	40,672	139,500	-	166,000		$42,913,738	$4,175,042
2035	216,250	8,635		$6,265,000	$572,316	830	206,785	166,000	40,785	139,500	-	166,000		$44,630,288	$4,077,036
2036	216,480	8,752		$6,421,000	$550,767	830	206,898	166,000	40,898	139,500	-	166,000		$46,415,499	$3,981,331
2037	216,710	8,869		$6,579,000	$529,878	830	207,011	166,000	41,011	139,500	-	166,000		$48,272,119	$3,887,873
2038	216,940	8,986		$6,740,000	$509,713	830	207,124	166,000	41,124	139,500	-	166,000		$50,203,004	$3,796,608
2039	217,170	9,103		$6,903,000	$490,179	830	207,237	166,000	41,237	139,500	67,737	139,500		$43,876,216	$3,116,628
2040	217,400	9,220		$7,068,000	$471,263	830	207,350	166,000	41,350	139,500	-	166,000		$54,299,569	$3,620,456
Subtotals:	8,898,500	257,160			$41,512,470	33,825	8,607,515					7,279,889			$278,250,671
		2.9%		Unit Cost ($/AF avoided):	$161	0.4%	96.7%					81.8%		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100387

Service Area "C" Resource Alternative 1 Present Worth

Year	Net Deficit (AF/yr)	Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $175 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $300 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0
2004	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0
2008	0	0		$0	$0	0		$0	$0
2009	0	0		$0	$0	0		$0	$0
2010	0	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2012	28,614	28,614		$14,606,964	$5,679,575	0		$0	$0
2013	29,511	29,511		$16,044,084	$5,857,620	0		$0	$0
2014	30,408	30,408		$17,608,314	$6,035,665	0		$0	$0
2015	31,305	31,305		$19,303,849	$6,213,710	0		$0	$0
2016	32,202	32,202		$21,147,676	$6,391,755	0		$0	$0
2017	33,099	33,099		$23,149,643	$6,569,800	0		$0	$0
2018	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	34,893	34,893		$27,680,055	$6,925,890	0		$0	$0
2020	35,790	35,790		$30,237,086	$7,103,935	0		$0	$0
2021	36,233	36,233		$32,601,092	$7,191,866	0		$0	$0
2022	36,676	36,676		$35,144,666	$7,279,796	0		$0	$0
2023	37,119	37,119		$37,881,168	$7,367,727	0		$0	$0
2024	37,562	37,562		$40,824,924	$7,455,658	0		$0	$0
2025	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	38,448	38,448		$47,396,868	$7,631,519	0		$0	$0
2027	38,891	38,891		$51,059,271	$7,719,450	0		$0	$0
2028	39,334	39,334		$54,997,534	$7,807,381	0		$0	$0
2029	39,777	39,777		$59,232,047	$7,895,312	0		$0	$0
2030	40,220	40,220		$63,784,661	$7,983,243	0		$0	$0
2031	40,333	40,333		$68,121,540	$8,005,672	0		$0	$0
2032	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2033	40,559	40,559		$77,698,097	$8,050,531	0		$0	$0
2034	40,672	40,672		$82,979,016	$8,072,960	0		$0	$0
2035	40,785	40,785		$88,618,180	$8,095,389	0		$0	$0
2036	40,898	40,898		$94,639,849	$8,117,818	0		$0	$0
2037	41,011	41,011		$101,069,923	$8,140,248	0		$0	$0
2038	41,124	41,124		$107,936,053	$8,162,677	0		$0	$0
2039	[illegible]	41,237		[illegible]	[illegible]	26,500		$126,984,254	$9,012,069
2040	41,350	41,350		$123,096,559	$8,207,536	0		$0	$0
Subtotals:	1,327,627 *14.9%*	1,108,215 *12.5%*		Unit Cost ($/AF purchased):	$219,968,903 $198	219,412 *2.5%*		Unit Cost ($/AF purchased):	$74,658,603 $340

Totals (with CVP allocation):	8,898,500		$614,390,646
		Unit Cost ($/AF):	$69
Totals (without CVP allocation):	1,618,612		$336,139,975
		Unit Cost ($/AF):	$208

Service Area "C" Resource Alternative 2 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 Capital Cost (1995): - O&M Cost (1995): - Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] Capital Cost (1995): - O&M Cost (1995): $56 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	167,700	[illegible]		[illegible]	[illegible]	[illegible]	165,840	[illegible]		[illegible]	[illegible]
1998	170,333	2,313		$1,372,000	$1,288,263	249	167,771	167,771		$10,568,316	$9,923,302
1999	172,967	2,892		$1,784,000	$1,572,880	374	169,701	169,701		$11,117,444	$9,801,797
2000	175,600	3,470		$2,226,000	$1,842,792	498	171,632	171,632		$11,693,728	$9,680,642
2001	177,840	3,952		$2,335,000	$1,815,049	623	173,265	173,265		$12,277,188	$9,543,342
2002	180,060	4,434		$2,448,000	$1,786,748	664	174,962	174,962		$12,894,805	$9,411,671
2003	182,320	4,916		$2,566,000	$1,758,567	706	176,698	176,698		$13,542,111	$9,280,871
2004	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	186,800	5,880		$2,820,000	$1,703,932	789	180,131	180,131		$14,931,721	$9,022,212
2006	189,040	6,362		$2,956,000	$1,677,096	830	181,848	181,848		$15,677,012	$8,894,403
2007	191,280	6,844		$3,096,000	$1,650,385	830	183,606	183,606		$16,461,711	$8,769,582
2008	193,520	7,326		$3,247,000	$1,624,189	830	185,364	185,364		$17,284,102	$8,645,720
2009	195,760	7,808		$3,403,000	$1,598,331	830	187,122	187,122		$18,145,947	$8,522,840
2010	198,000	8,290		$3,566,000	$1,572,668	830	188,880	188,880		$19,049,084	$8,400,965
2011	199,150	8,772		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	200,300	9,254		$3,915,000	$1,522,256	830	190,216	166,000		$18,107,683	$7,040,747
2013	201,450	9,736		$4,102,000	$1,497,621	830	190,884	166,000		$18,831,990	$6,875,472
2014	202,600	10,218		$4,298,000	$1,473,408	830	191,552	166,000		$19,585,270	$6,714,076
2015	203,750	10,700		$4,503,000	$1,449,469	830	192,220	166,000		$20,368,681	$6,556,468
2016	204,900	11,182		$4,717,000	$1,425,684	830	192,888	166,000		$21,183,428	$6,402,561
2017	206,050	11,664		$4,941,000	$1,402,241	830	193,556	166,000		$22,030,765	$6,252,268
2018	207,200	[illegible]		[illegible]	[illegible]	830	194,224	139,500		[illegible]	[illegible]
2019	208,350	12,628		$5,421,000	$1,356,401	830	194,892	166,000		$23,828,476	$5,962,177
2020	209,500	13,110		$5,678,000	$1,333,998	830	195,560	166,000		$24,781,615	$5,822,220
2021	210,060	13,366		$5,851,000	$1,290,742	830	195,864	166,000		$25,772,879	$5,685,548
2022	210,620	13,621		$6,029,000	$1,248,835	830	196,169	166,000		$26,803,794	$5,552,065
2023	211,180	13,877		$6,212,000	$1,208,208	830	196,473	166,000		$27,875,946	$5,421,754
2024	211,740	14,132		$6,399,000	$1,168,618	830	196,778	166,000		$28,990,984	$5,294,483
2025	212,300	[illegible]		[illegible]	[illegible]	[illegible]	197,082	139,500		[illegible]	[illegible]
2026	212,860	14,643		$6,790,000	$1,093,279	830	197,387	166,000		$31,356,648	$5,048,833
2027	213,420	14,899		$6,993,000	$1,057,244	830	197,691	166,000		$32,610,914	$4,930,316
2028	213,980	15,154		$7,202,000	$1,022,387	830	197,996	166,000		$33,915,351	$4,814,581
2029	214,540	15,410		$7,416,000	$988,513	830	198,300	166,000		$35,271,965	$4,701,562
2030	215,100	15,665		$7,636,000	$955,716	830	198,605	166,000		$36,682,843	$4,591,197
2031	215,330	15,921		$7,861,000	$923,828	830	198,579	166,000		$38,150,157	$4,483,422
2032	215,560	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2033	215,790	16,432		$8,329,000	$862,992	830	198,528	166,000		$41,263,210	$4,275,404
2034	216,020	16,687		$8,573,000	$834,060	830	198,503	166,000		$42,913,738	$4,175,042
2035	216,250	16,943		$8,822,000	$805,901	830	198,477	166,000		$44,630,288	$4,077,036
2036	216,480	17,198		$9,077,000	$778,588	830	198,452	166,000		$46,415,499	$3,981,331
2037	216,710	17,454		$9,339,000	$752,170	830	198,426	166,000		$48,272,119	$3,887,873
2038	216,940	17,709		$9,607,000	$726,531	830	198,401	166,000		$50,203,004	$3,796,608
2039	217,170	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	217,400	18,220		$10,164,000	$677,691	830	198,350	166,000		$54,299,569	$3,620,456
Subtotals:	8,898,500	496,890			$56,120,124	33,825	8,367,785	7,246,891			$276,587,364
		5.6%		Unit Cost ($/AF avoided):	$113	0.4%	94.0%	81.4%		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100389

Service Area "C" Resource Alternative 2 Present Worth

Year	Net Deficit (AF/yr)	Surface Water Transfer — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
		Capital Cost (1995):		-		Capital Cost (1995):		-	
		O&M Cost (1995):		$175		O&M Cost (1995):		$300	
1997	[illegible]	0		$0	$0	41,460		$14,107,491	$14,107,491
1998	0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0
2004	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0
2008	0	0		$0	$0	0		$0	$0
2009	0	0		$0	$0	0		$0	$0
2010	0	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2012	24,216	24,216		$12,361,859	$4,806,619	0		$0	$0
2013	24,884	24,884		$13,528,548	$4,939,210	0		$0	$0
2014	25,552	25,552		$14,794,677	$5,071,801	0		$0	$0
2015	26,220	26,220		$16,168,245	$5,204,391	0		$0	$0
2016	26,888	26,888		$17,657,870	$5,336,982	0		$0	$0
2017	27,556	27,556		$19,272,835	$5,469,573	0		$0	$0
2018	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2019	28,892	28,892		$22,919,558	$5,734,755	0		$0	$0
2020	29,560	29,560		$24,973,687	$5,867,346	0		$0	$0
2021	29,864	29,864		$26,870,505	$5,927,687	0		$0	$0
2022	30,169	30,169		$28,909,353	$5,988,226	0		$0	$0
2023	30,473	30,473		$31,098,703	$6,048,567	0		$0	$0
2024	30,778	30,778		$33,451,613	$6,109,106	0		$0	$0
2025	[illegible]	31,082		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	31,387	31,387		$38,692,403	$6,229,986	0		$0	$0
2027	31,691	31,691		$41,606,525	$6,290,327	0		$0	$0
2028	31,996	31,996		$44,737,405	$6,350,868	0		$0	$0
2029	32,300	32,300		$48,098,024	$6,411,207	0		$0	$0
2030	32,605	32,605		$51,708,093	$6,471,746	0		$0	$0
2031	32,579	32,579		$55,025,206	$6,466,585	0		$0	$0
2032	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2033	32,528	32,528		$62,313,265	$6,456,462	0		$0	$0
2034	32,503	32,503		$66,312,622	$6,451,500	0		$0	$0
2035	32,477	32,477		$70,566,449	$6,446,339	0		$0	$0
2036	32,452	32,452		$75,096,417	$6,441,377	0		$0	$0
2037	32,426	32,426		$79,912,543	$6,436,216	0		$0	$0
2038	32,401	32,401		$85,041,243	$6,431,254	0		$0	$0
2039	[illegible]	32,375		[illegible]	[illegible]	26,500		$126,984,254	[illegible]
2040	32,350	32,350		$96,304,079	$6,421,131	0		$0	$0
Subtotals:	1,121,094	902,530			$179,142,616	218,564			$74,370,141
	12.6%	*10.1%*		Unit Cost ($/AF purchased):	$198	*2.5%*		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	8,898,500		$586,220,244
		Unit Cost ($/AF):	$66
Totals (without CVP allocation):	1,651,809		$309,632,880
		Unit Cost ($/AF):	$187

C-100390

C—100390

Service Area "C" Resource Alternative 3 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 — Capital Cost (1995): - ; O&M Cost (1995): - — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project — Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] — Capital Cost (1995): - ; O&M Cost (1995): $56 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	167,700	1,735		$990,000	$990,000	125	165,840	124,380		$7,533,647	$7,533,647
1998	170,333	2,313		$1,372,000	$1,288,263	249	167,771	167,771		$10,568,316	$9,923,302
1999	172,957	2,892		$1,784,000	$1,572,880	374	169,701	169,701		$11,117,444	$9,801,797
2000	175,600	3,470		$2,226,000	$1,842,792	498	171,632	171,632		$11,693,728	$9,680,642
2001	177,840	3,952		$2,335,000	$1,815,049	623	173,265	173,265		$12,277,188	$9,543,342
2002	180,080	4,434		$2,448,000	$1,786,748	664	174,982	174,982		$12,894,805	$9,411,671
2003	182,320	4,916		$2,566,000	$1,758,567	706	176,698	176,698		$13,542,111	$9,280,871
2004	184,560	5,398		$2,690,000	$1,731,032	747	178,415	133,811		[illegible]	[illegible]
2005	186,800	5,880		$2,820,000	$1,703,932	789	180,131	180,131		$14,931,721	$9,022,212
2006	189,040	6,362		$2,956,000	$1,677,096	830	181,848	181,848		$15,677,012	$8,894,403
2007	191,280	6,844		$3,098,000	$1,650,385	830	183,606	183,606		$16,461,711	$8,769,582
2008	193,520	7,326		$3,247,000	$1,624,189	830	185,364	185,364		$17,284,102	$8,645,720
2009	195,760	7,808		$3,403,000	$1,598,331	830	187,122	187,122		$18,145,947	$8,522,840
2010	198,000	8,290		$3,566,000	$1,572,666	830	188,880	188,880		$19,049,084	$8,400,965
2011	199,150	8,772		$3,737,000	$1,547,493	830	189,548	139,500		[illegible]	$6,060,003
2012	200,300	9,254		$3,915,000	$1,522,256	830	190,216	166,000		$18,107,683	$7,040,747
2013	201,450	9,736		$4,102,000	$1,497,621	830	190,884	166,000		$18,831,990	$6,875,472
2014	202,600	10,218		$4,298,000	$1,473,408	830	191,552	166,000		$19,585,270	$6,714,076
2015	203,750	10,700		$4,503,000	$1,449,469	830	192,220	166,000		$20,368,681	$6,556,468
2016	204,900	11,182		$4,717,000	$1,425,684	830	192,888	166,000		$21,183,428	$6,402,561
2017	206,050	11,664		$4,941,000	$1,402,241	830	193,556	166,000		$22,030,765	$6,252,266
2018	207,200	12,146		$5,176,000	$1,379,260	830	194,224	139,500		[illegible]	[illegible]
2019	208,350	12,628		$5,421,000	$1,356,401	830	194,892	166,000		$23,828,476	$5,962,177
2020	209,500	13,110		$5,678,000	$1,333,996	830	195,560	166,000		$24,781,615	$5,822,220
2021	210,060	13,366		$5,851,000	$1,290,742	830	195,864	166,000		$25,772,879	$5,685,548
2022	210,620	13,621		$6,029,000	$1,248,835	830	196,169	166,000		$26,803,794	$5,552,085
2023	211,180	13,877		$6,212,000	$1,208,208	830	196,473	166,000		$27,875,946	$5,421,754
2024	211,740	14,132		$6,399,000	$1,168,618	830	196,778	166,000		$28,990,984	$5,294,483
2025	212,300	14,388		$6,592,000	$1,130,390	830	197,082	139,500		[illegible]	[illegible]
2026	212,860	14,643		$6,790,000	$1,093,279	830	197,387	166,000		$31,356,648	$5,048,833
2027	213,420	14,899		$6,993,000	$1,057,244	830	197,691	166,000		$32,610,914	$4,930,316
2028	213,980	15,154		$7,202,000	$1,022,387	830	197,996	166,000		$33,915,351	$4,814,581
2029	214,540	15,410		$7,416,000	$988,513	830	198,300	166,000		$35,271,965	$4,701,562
2030	215,100	15,665		$7,636,000	$955,716	830	198,605	166,000		$36,682,843	$4,591,197
2031	215,330	15,921		$7,861,000	$923,828	830	198,579	166,000		$38,150,157	$4,483,422
2032	215,560	16,176		$8,092,000	[illegible]	830	198,554	139,500		[illegible]	$3,579,252
2033	215,790	16,432		$8,329,000	$862,992	830	198,528	166,000		$41,263,210	$4,275,404
2034	216,020	16,687		$8,573,000	$834,060	830	198,503	166,000		$42,913,738	$4,175,042
2035	216,250	16,943		$8,822,000	$805,901	830	198,477	166,000		$44,630,288	$4,077,036
2036	216,480	17,198		$9,077,000	$778,588	830	198,452	166,000		$46,415,499	$3,981,331
2037	216,710	17,454		$9,339,000	$752,170	830	198,426	166,000		$48,272,119	$3,887,873
2038	216,940	17,709		$9,607,000	$726,531	830	198,401	166,000		$50,203,004	$3,796,608
2039	217,170	17,965		$9,882,000	[illegible]	830	198,375	139,500		[illegible]	[illegible]
2040	217,400	18,220		$10,164,000	$677,691	830	198,350	166,000		$54,299,569	$3,620,456
Subtotals:	8,898,500	498,890			$56,120,124	33,825	8,367,785	7,246,691			$276,587,364
		5.6%		Unit Cost ($/AF avoided):	$113	0.4%	94.0%	81.4%		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100391

C-100391

Service Area "C" Resource Alternative 3 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation Capital Cost (1995): $24,660,000 O&M Cost (1995): $337 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation Capital Cost (1995): $24,360,000 O&M Cost (1995): $320 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	21,460	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0
2004	22,502	0		$0	$0	0		$0	$0
2005	0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0
2008	0	0		$0	$0	0		$0	$0
2009	0	0		$0	$0	0		$0	$0
2010	0	0		$0	$0	0		$0	$0
2011	23,543	0		$0	$0	0		$0	$0
2012	24,216	0		$0	$0	0		$0	$0
2013	24,884	0		$0	$0	0		$0	$0
2014	25,552	0		$0	$0	0		$0	$0
2015	26,220	0		$0	$0	0		$0	$0
2016	26,888	0		$0	$0	0		$0	$0
2017	27,556	0	$29,221,099	$0	$8,292,861	0	$28,865,611	$0	$8,191,975
2018	28,224	0		$0	$0	0		$0	$0
2019	28,892	0		$0	$0	0		$0	$0
2020	29,560	1,687		$1,515,579	$356,072	2,100		$1,791,442	$420,883
2021	29,864	1,687		$1,576,202	$347,713	2,100		$1,863,100	$411,003
2022	30,169	1,687		$1,639,250	$339,551	2,100		$1,937,624	$401,356
2023	30,473	1,687		$1,704,820	$331,580	2,100		$2,015,129	$391,934
2024	30,778	1,687		$1,773,013	$323,797	2,100		$2,095,734	$382,734
2025	31,082	1,687		$1,843,933	$316,195	2,100		$2,179,563	$373,749
2026	31,387	1,687		$1,917,690	$308,773	2,100		$2,266,746	$364,976
2027	31,691	1,687		$1,994,398	$301,525	2,100		$2,357,415	$356,408
2028	31,996	1,687		$2,074,174	$294,447	2,100		$2,451,712	$348,042
2029	32,300	1,687		$2,157,141	$287,535	2,100		$2,549,781	$339,872
2030	32,605	1,687		$2,243,427	$280,786	2,100		$2,651,772	$331,894
2031	32,579	1,687		$2,333,164	$274,194	2,100		$2,757,843	$324,103
2032	32,554	1,687		$2,426,490	$267,756	2,100		$2,868,157	$316,494
2033	32,528	1,687		$2,523,550	$261,472	2,100		$2,982,883	$309,065
2034	32,503	1,687		$2,624,492	$255,335	2,100		$3,102,198	$301,810
2035	32,477	1,687		$2,729,471	$249,341	2,100		$3,226,286	$294,726
2036	32,452	1,687		$2,838,650	$243,488	2,100		$3,355,337	$287,807
2037	32,426	1,687		$2,952,196	$237,772	2,100		$3,489,551	$281,051
2038	32,401	1,687		$3,070,284	$232,191	2,100		$3,629,133	$274,454
2039	32,375	1,687		$3,193,095	$226,741	2,100		$3,774,298	$268,013
2040	32,350	1,687		$3,320,819	$221,418	2,100		$3,925,270	$261,720
Subtotals:	1,121,094	35,427			$22,348,738	44,100			$23,233,742
	12.6%	*0.4%*		Unit Cost ($/AF):	$631	*0.5%*		Unit Cost ($/AF):	$527

Service Area "C" Resource Alternative 3 Present Worth

Year	Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $175 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $300 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0
2008	0		$0	$0	0		$0	$0
2009	0		$0	$0	0		$0	$0
2010	0		$0	$0	0		$0	$0
2011	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2012	24,216		$12,361,859	$4,806,619	0		$0	$0
2013	24,884		$13,528,548	$4,939,210	0		$0	$0
2014	25,552		$14,794,677	$5,071,801	0		$0	$0
2015	26,220		$16,168,245	$5,204,391	0		$0	$0
2016	26,888		$17,657,870	$5,336,982	0		$0	$0
2017	27,556		$19,272,835	$5,469,573	0		$0	$0
2018	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2019	28,892		$22,919,558	$5,734,755	0		$0	$0
2020	25,773		$21,774,251	$5,115,867	0		$0	$0
2021	26,077		$23,463,105	$5,176,007	0		$0	$0
2022	26,382		$25,280,472	$5,236,547	0		$0	$0
2023	26,686		$27,233,944	$5,296,887	0		$0	$0
2024	26,991		$29,335,646	$5,357,427	0		$0	$0
2025	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	27,600		$34,023,969	$5,478,307	0		$0	$0
2027	27,904		$36,634,843	$5,538,848	0		$0	$0
2028	28,209		$39,442,351	$5,599,187	0		$0	$0
2029	28,513		$42,458,791	$5,659,528	0		$0	$0
2030	28,818		$45,702,311	$5,720,067	0		$0	$0
2031	28,792		$48,829,047	$5,714,906	0		$0	$0
2032	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2033	28,741		$55,058,582	$5,704,783	0		$0	$0
2034	28,716		$58,586,384	$5,699,821	0		$0	$0
2035	28,690		$62,338,006	$5,694,660	0		$0	$0
2036	28,665		$66,332,125	$5,689,698	0		$0	$0
2037	28,639		$70,579,638	$5,684,537	0		$0	$0
2038	28,614		$75,101,698	$5,679,575	0		$0	$0
2039	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2040	28,563		$85,030,399	$5,669,452	0		$0	$0
Subtotals:	$23,003 *9.2%*		Unit Cost ($/AF purchased):	$163,357,351 $198	219,564 *2.5%*		Unit Cost ($/AF purchased):	$74,370,141 $340

Totals (with CVP allocation):	8,898,500		$616,017,459
		Unit Cost ($/AF):	$69
Totals (without CVP allocation):	1,651,809		$339,430,095
		Unit Cost ($/AF):	$205

C-100393

Service Area "C" Resource Alternative 3a Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 — Capital Cost (1995): - ; O&M Cost (1995): - — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project — Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] — Capital Cost (1995): - ; O&M Cost (1995): $56 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	167,700	[illegible]		$990,000	$990,000	125	165,840	124,380		$7,533,647	$7,533,647
1998	170,333	2,313		$1,372,000	$1,288,263	249	167,771	167,771		$10,568,316	$9,923,302
1999	172,967	2,892		$1,784,000	$1,572,880	374	169,701	169,701		$11,117,444	$9,801,797
2000	175,600	3,470		$2,226,000	$1,842,792	498	171,632	171,632		$11,693,728	$9,680,642
2001	177,840	3,952		$2,335,000	$1,815,049	623	173,265	173,265		$12,277,188	$9,543,342
2002	180,080	4,434		$2,448,000	$1,786,748	664	174,982	174,982		$12,894,805	$9,411,671
2003	182,320	4,916		$2,566,000	$1,758,567	706	176,698	176,698		$13,542,111	$9,280,871
2004	184,560	[illegible]		[illegible]	[illegible]	747	178,415	[illegible]		[illegible]	[illegible]
2005	186,800	5,880		$2,820,000	$1,703,932	789	180,131	180,131		$14,931,721	$9,022,212
2006	189,040	6,362		$2,956,000	$1,677,096	830	181,848	181,848		$15,677,012	$8,894,403
2007	191,280	6,844		$3,098,000	$1,650,385	830	183,606	183,606		$16,461,711	$8,769,582
2008	193,520	7,326		$3,247,000	$1,624,189	830	185,364	185,364		$17,284,102	$8,645,720
2009	195,760	7,808		$3,403,000	$1,598,331	830	187,122	187,122		$18,145,947	$8,522,840
2010	198,000	8,290		$3,566,000	$1,572,666	830	188,880	188,880		$19,049,084	$8,400,965
2011	199,150	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2012	200,300	9,254		$3,915,000	$1,522,256	830	190,216	166,000		$18,107,683	$7,040,747
2013	201,450	9,736		$4,102,000	$1,497,621	830	190,884	166,000		$18,831,990	$6,875,472
2014	202,600	10,218		$4,298,000	$1,473,408	830	191,552	166,000		$19,585,270	$6,714,076
2015	203,750	10,700		$4,503,000	$1,449,469	830	192,220	166,000		$20,368,681	$6,556,468
2016	204,900	11,182		$4,717,000	$1,425,684	830	192,888	166,000		$21,183,428	$6,402,561
2017	206,050	11,664		$4,941,000	$1,402,241	830	193,556	166,000		$22,030,765	$6,252,268
2018	207,200	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2019	208,350	12,628		$5,421,000	$1,356,401	830	194,892	166,000		$23,828,476	$5,962,177
2020	209,500	13,110		$5,678,000	$1,333,996	830	195,560	166,000		$24,781,615	$5,822,220
2021	210,060	13,366		$5,851,000	$1,290,742	830	195,864	166,000		$25,772,879	$5,685,548
2022	210,620	13,621		$6,029,000	$1,248,835	830	196,169	166,000		$26,803,794	$5,552,085
2023	211,180	13,877		$6,212,000	$1,208,208	830	196,473	166,000		$27,875,946	$5,421,754
2024	211,740	14,132		$6,399,000	$1,168,618	830	196,778	166,000		$28,990,984	$5,294,483
2025	212,300	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2026	212,860	14,643		$6,790,000	$1,093,279	830	197,387	166,000		$31,356,648	$5,048,833
2027	213,420	14,899		$6,993,000	$1,057,244	830	197,691	166,000		$32,610,914	$4,930,316
2028	213,980	15,154		$7,202,000	$1,022,387	830	197,996	166,000		$33,915,351	$4,814,581
2029	214,540	15,410		$7,416,000	$988,513	830	198,300	166,000		$35,271,965	$4,701,562
2030	215,100	15,665		$7,636,000	$955,716	830	198,605	166,000		$36,682,843	$4,591,197
2031	215,330	15,921		$7,861,000	$923,828	830	198,579	166,000		$38,150,157	$4,483,422
2032	215,560	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2033	215,790	16,432		$8,329,000	$862,992	830	198,528	166,000		$41,263,210	$4,275,404
2034	216,020	16,687		$8,573,000	$834,060	830	198,503	166,000		$42,913,738	$4,175,042
2035	216,250	16,943		$8,822,000	$805,901	830	198,477	166,000		$44,630,288	$4,077,036
2036	216,480	17,198		$9,077,000	$778,588	830	198,452	166,000		$46,415,499	$3,981,331
2037	216,710	17,454		$9,339,000	$752,170	830	198,426	166,000		$48,272,119	$3,887,873
2038	216,940	17,709		$9,607,000	$726,531	830	198,401	166,000		$50,203,004	$3,796,608
2039	217,170	[illegible]		[illegible]	[illegible]	830	198,375	139,500		[illegible]	[illegible]
2040	217,400	18,220		$10,164,000	$677,691	830	198,350	166,000		$54,299,569	$3,620,456
Subtotals:	8,898,500	496,890			$56,120,124	33,825	8,367,785	7,246,691			$276,587,364
		5.6%		Unit Cost ($/AF avoided):	$113	0.4%	94.0%	81.4%		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100394

Service Area "C" Resource Alternative 3a Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation — Capital Cost (1995): $24,660,000; O&M Cost (1995): $337 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation — Capital Cost (1995): $24,360,000; O&M Cost (1995): $320 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Central County Industrial (Cooling Towers) — Capital Cost (1995): $4,300,000; O&M Cost (1995): $685 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	41,460	0		$0	$0	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	44,504	0		$0	$0	0		$0	$0	0		$0	$0
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0	0		$0	$0
2008	0	0		$0	$0	0		$0	$0	0		$0	$0
2009	0	0		$0	$0	0		$0	$0	0		$0	$0
2010	0	0		$0	$0	0		$0	$0	0		$0	$0
2011	50,048	0		$0	$0	0		$0	$0	0		$0	$0
2012	24,216	0		$0	$0	0		$0	$0	0		$0	$0
2013	24,884	0		$0	$0	0		$0	$0	0		$0	$0
2014	25,552	0	$25,977,450	$0	$8,905,395	0	$25,661,423	$0	$8,797,057	0	$4,529,726	$0	$1,552,847
2015	26,220	0	$27,016,548	$0	$8,696,348	0	$26,687,880	$0	$8,590,553	0	$4,710,915	$0	$1,516,395
2016	26,888	0		$0	$0	0		$0	$0	0		$0	$0
2017	27,556	1,687		$1,347,344	$382,372	2,100		$1,592,585	$451,971	1,700		$2,759,770	$783,215
2018	54,724	1,687		$1,401,238	[illegible]	2,100		[illegible]	[illegible]	1,700		[illegible]	[illegible]
2019	28,892	1,687		$1,457,287	$364,631	2,100		$1,722,540	$431,001	1,700		$2,984,968	$746,876
2020	29,560	1,687		$1,515,579	$356,072	2,100		$1,791,442	$420,883	1,700		$3,104,366	$729,343
2021	29,864	1,687		$1,576,202	$347,713	2,100		$1,863,100	$411,003	1,700		$3,228,541	$712,223
2022	30,169	1,687		$1,639,250	$339,551	2,100		$1,937,624	$401,356	1,700		$3,357,683	$695,504
2023	30,473	1,687		$1,704,820	$331,580	2,100		$2,015,129	$391,934	1,700		$3,491,990	$679,177
2024	30,778	1,687		$1,773,013	$323,797	2,100		$2,095,734	$382,734	1,700		$3,631,670	$663,234
2025	57,582	1,687		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	1,700		[illegible]	[illegible]
2026	31,387	1,687		$1,917,690	$308,773	2,100		$2,266,746	$364,976	1,700		$3,928,014	$632,462
2027	31,691	1,687		$1,994,398	$301,525	2,100		$2,357,415	$356,408	1,700		$4,085,134	$617,615
2028	31,996	1,687		$2,074,174	$294,447	2,100		$2,451,712	$348,042	1,700		$4,248,540	$603,117
2029	32,300	1,687		$2,157,141	$287,535	2,100		$2,549,781	$339,872	1,700		$4,418,481	$588,960
2030	32,605	1,687		$2,243,427	$280,786	2,100		$2,651,772	$331,894	1,700		$4,595,221	$575,134
2031	32,579	1,687		$2,333,164	$274,194	2,100		$2,757,843	$324,103	1,700		$4,779,029	$561,634
2032	59,054	1,687		$2,426,490	[illegible]	2,100		[illegible]	[illegible]	1,700		$4,970,191	$548,450
2033	32,528	1,687		$2,523,550	$261,472	2,100		$2,982,883	$309,065	1,700		$5,168,998	$535,575
2034	32,503	1,687		$2,624,492	$255,335	2,100		$3,102,198	$301,810	1,700		$5,375,758	$523,003
2035	32,477	1,687		$2,729,471	$249,341	2,100		$3,226,286	$294,726	1,700		$5,590,789	$510,726
2036	32,452	1,687		$2,838,650	$243,488	2,100		$3,355,337	$287,807	1,700		$5,814,420	$498,737
2037	32,426	1,687		$2,952,196	$237,772	2,100		$3,489,551	$281,051	1,700		$6,046,997	$487,030
2038	32,401	1,687		$3,070,284	$232,191	2,100		$3,629,133	$274,454	1,700		$6,288,877	$475,597
2039	58,875	1,687		$3,193,096	$226,740	2,100		$3,774,298	[illegible]	1,700		$6,540,432	$464,433
2040	32,350	1,687		$3,320,819	$221,418	2,100		$3,925,270	$261,720	1,700		$6,802,049	$453,531
Subtotals:	1,121,094	40,488			$24,679,827	50,400			$25,754,036	40,800			$17,567,311
	12.6%	*0.5%*		Unit Cost ($/AF):	$610	*0.6%*		Unit Cost ($/AF):	$511	*0.5%*		Unit Cost ($/AF):	$431

C-100395

C-100395

Service Area "C" Resource Alternative 3a Present Worth

Year	Surface Water Transfer				Spot Surface Water Transfer			
	Capital Cost (1995):		-		Capital Cost (1995):		-	
	O&M Cost (1995):		$175		O&M Cost (1995):		$300	
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	41,460		$14,107,491	$14,107,491
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0
2008	0		$0	$0	0		$0	$0
2009	0		$0	$0	0		$0	$0
2010	0		$0	$0	0		$0	$0
2011	23,548		$11,257,166	$4,674,026	26,500		$21,275,136	$9,017,069
2012	24,216		$12,361,859	$4,806,619	0		$0	$0
2013	24,884		$13,528,548	$4,939,210	0		$0	$0
2014	25,552		$14,794,677	$5,071,801	0		$0	$0
2015	26,220		$16,168,245	$5,204,391	0		$0	$0
2016	26,888		$17,657,870	$5,336,982	0		$0	$0
2017	22,069		$15,435,193	$4,380,462	0		$0	$0
2018	22,737		$16,938,052	$4,513,063	26,500		$33,838,267	$9,017,069
2019	23,405		$18,566,809	$4,645,644	0		$0	$0
2020	24,073		$20,338,010	$4,778,235	0		$0	$0
2021	24,377		$21,933,509	$4,838,575	0		$0	$0
2022	24,682		$23,651,452	$4,899,115	0		$0	$0
2023	24,986		$25,499,038	$4,959,456	0		$0	$0
2024	25,291		$27,487,970	$5,019,995	0		$0	$0
2025	25,595		$29,626,673	$5,080,356	26,500		$52,584,211	$9,017,069
2026	25,900		$31,928,290	$5,140,875	0		$0	$0
2027	26,204		$34,402,744	$5,201,216	0		$0	$0
2028	26,509		$37,065,379	$5,261,755	0		$0	$0
2029	26,813		$39,927,316	$5,322,096	0		$0	$0
2030	27,118		$43,006,290	$5,382,635	0		$0	$0
2031	27,092		$45,757,785	$5,377,474	0		$0	$0
2032	27,067		$48,567,072	$5,372,31[illegible]	26,500		$81,715,166	$9,017,069
2033	27,041		$51,801,924	$5,367,351	0		$0	$0
2034	27,016		$55,118,044	$5,362,389	0		$0	$0
2035	26,990		$58,644,224	$5,357,228	0		$0	$0
2036	26,965		$62,398,247	$5,352,266	0		$0	$0
2037	26,939		$66,390,058	$5,347,105	0		$0	$0
2038	26,914		$70,639,795	$5,342,143	0		$0	$0
2039	26,888		$75,158,705	$5,336,982	26,500		$126,984,254	$9,017,069
2040	26,863		$79,969,598	$5,332,020	0		$0	$0
Subtotals:	770,842			$153,003,947	218,564			$74,370,141
	8.7%	Unit Cost ($/AF purchased):		$198	2.5%	Unit Cost ($/AF purchased):		$340

Totals (with CVP allocation):	8,898,500		$628,082,749
		Unit Cost ($/AF):	$71
Totals (without CVP allocation):	1,651,809		$351,495,385
		Unit Cost ($/AF):	$213

Service Area "C" Resource Alternative 4 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 Quantity (AF/yr)	Conservation Program 2 Escalated Capital Cost	Conservation Program 2 Escalated O&M Cost	Conservation Program 2 Total Present Worth Cost	CCCSD Zone 1 Project Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] Quantity (AF/yr)	CVP Raw Water Allocation [c] Escalated Capital Cost	CVP Raw Water Allocation [c] Escalated O&M Cost	CVP Raw Water Allocation [c] Total Present Worth Cost
		Capital Cost (1995): - O&M Cost (1995): -						Capital Cost (1995): - O&M Cost (1995): $56			
1997	167,700	1,736		$190,000	$190,000	125	165,840	124,680		$6,983,647	$6,983,647
1998	170,333	2,313		$1,372,000	$1,288,263	249	167,771	167,771		$10,568,316	$9,923,302
1999	172,967	2,892		$1,784,000	$1,572,880	374	169,701	169,701		$11,117,444	$9,801,797
2000	175,600	3,470		$2,226,000	$1,842,792	498	171,632	171,632		$11,693,728	$9,680,642
2001	177,840	3,952		$2,335,000	$1,815,049	623	173,265	173,265		$12,277,188	$9,543,342
2002	180,080	4,434		$2,448,000	$1,786,748	664	174,982	174,982		$12,894,805	$9,411,671
2003	182,320	4,916		$2,566,000	$1,758,557	706	176,698	176,698		$13,542,111	$9,280,871
2004	184,560	5,399		$2,690,000	$1,731,042	747	178,414	178,414		$14,219,217	$9,151,307
2005	186,800	5,880		$2,820,000	$1,703,932	789	180,131	180,131		$14,931,721	$9,022,212
2006	189,040	6,362		$2,956,000	$1,677,096	830	181,848	181,848		$15,677,012	$8,894,403
2007	191,280	6,844		$3,098,000	$1,650,385	830	183,606	183,606		$16,461,711	$8,769,582
2008	193,520	7,326		$3,247,000	$1,624,189	830	185,364	185,364		$17,284,102	$8,645,720
2009	195,760	7,808		$3,403,000	$1,598,331	830	187,122	187,122		$18,145,947	$8,522,840
2010	198,000	8,290		$3,566,000	$1,572,666	830	188,880	188,880		$19,049,084	$8,400,965
2011	199,160	8,772		$3,737,000	$1,547,249	830	189,548	130,500		$14,083,124	$6,059,003
2012	200,300	9,254		$3,915,000	$1,522,256	830	190,216	166,000		$18,107,683	$7,040,747
2013	201,450	9,736		$4,102,000	$1,497,621	830	190,884	166,000		$18,831,990	$6,875,472
2014	202,600	10,218		$4,298,000	$1,473,408	830	191,552	166,000		$19,585,270	$6,714,076
2015	203,750	10,700		$4,503,000	$1,449,469	830	192,220	166,000		$20,368,681	$6,556,468
2016	204,900	11,182		$4,717,000	$1,425,684	830	192,888	166,000		$21,183,428	$6,402,561
2017	206,050	11,664		$4,941,000	$1,402,241	830	193,556	166,000		$22,030,765	$6,252,266
2018	207,200	12,146		$5,176,000	$1,379,240	830	194,224	131,500		$19,254,555	$5,130,826
2019	208,350	12,628		$5,421,000	$1,356,401	830	194,892	166,000		$23,828,476	$5,962,177
2020	209,500	13,110		$5,678,000	$1,333,996	830	195,560	166,000		$24,781,615	$5,822,220
2021	210,060	13,366		$5,851,000	$1,290,742	830	195,864	166,000		$25,772,879	$5,685,548
2022	210,620	13,621		$6,029,000	$1,248,835	830	196,169	166,000		$26,803,794	$5,552,065
2023	211,180	13,877		$6,212,000	$1,208,208	830	196,473	166,000		$27,875,946	$5,421,754
2024	211,740	14,132		$6,399,000	$1,168,818	830	196,778	166,000		$28,990,984	$5,294,483
2025	212,300	14,388		$6,592,000	$1,130,630	830	197,082	136,500		$23,837,421	$4,344,836
2026	212,860	14,643		$6,790,000	$1,093,279	830	197,387	166,000		$31,356,648	$5,048,833
2027	213,420	14,899		$6,993,000	$1,057,244	830	197,691	166,000		$32,610,914	$4,930,316
2028	213,980	15,154		$7,202,000	$1,022,387	830	197,996	166,000		$33,915,351	$4,814,581
2029	214,540	15,410		$7,416,000	$988,513	830	198,300	166,000		$35,271,965	$4,701,562
2030	215,100	15,665		$7,636,000	$955,716	830	198,605	166,000		$36,682,843	$4,591,197
2031	215,330	15,921		$7,861,000	$923,828	830	198,579	166,000		$38,150,157	$4,483,422
2032	215,560	16,177		$8,092,000	$892,923	830	198,554	139,500		$33,342,218	$3,677,252
2033	215,790	16,432		$8,329,000	$862,992	830	198,528	166,000		$41,263,210	$4,275,404
2034	216,020	16,687		$8,573,000	$834,060	830	198,503	166,000		$42,913,738	$4,175,042
2035	216,250	16,943		$8,822,000	$805,901	830	198,477	166,000		$44,630,288	$4,077,036
2036	216,480	17,198		$9,077,000	$778,588	830	198,452	166,000		$46,415,499	$3,981,331
2037	216,710	17,454		$9,339,000	$752,170	830	198,426	166,000		$48,272,119	$3,887,873
2038	216,940	17,709		$9,607,000	$726,531	830	198,401	166,000		$50,203,004	$3,796,608
2039	217,170	17,965		$9,882,000	$701,741	830	198,375	146,500		$45,879,215	$3,213,523
2040	217,400	18,220		$10,164,000	$677,691	830	198,350	166,000		$54,299,569	$3,620,456
Subtotals:	8,898,500	496,890			$56,120,124	33,825	8,367,785	7,246,691			$276,587,364
		5.6%	Unit Cost ($/AF avoided):		$113	0.4%	94.0%	81.4%	Unit Cost ($/AF purchased):		$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100397

Service Area "C" Resource Alternative 4 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation (Capital Cost (1995): $24,660,000; O&M Cost (1995): $337) Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation (Capital Cost (1995): $24,360,000; O&M Cost (1995): $320) Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Central County Industrial (Cooling Towers) (Capital Cost (1995): $48,460,000; O&M Cost (1995): $935) Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	41,560	0		$0	$0	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	44,604	0		$0	$0	0		$0	$0	0		$0	$0
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0	0		$0	$0
2008	0	0		$0	$0	0		$0	$0	0	$40,344,731	$0	$20,180,928
2009	0	0		$0	$0	0		$0	$0	0	$41,958,520	$0	$19,707,198
2010	0	0		$0	$0	0		$0	$0	0		$0	$0
2011	50,048	0		$0	$0	0		$0	$0	13,300		$23,291,458	[illegible]
2012	24,216	0		$0	$0	0		$0	$0	13,300		$24,223,117	$9,418,590
2013	24,884	0		$0	$0	0		$0	$0	13,300		$25,192,041	$9,197,497
2014	25,552	0		$0	$0	0		$0	$0	13,300		$26,199,723	$8,981,593
2015	26,220	0		$0	$0	0		$0	$0	13,300		$27,247,712	$8,770,757
2016	26,888	0		$0	$0	0		$0	$0	13,300		$28,337,620	$8,564,871
2017	27,556	0	$29,221,099	$0	$8,292,861	0	$28,865,611	$0	$8,191,975	13,300		$29,471,125	$8,363,818
2018	54,724	0	[illegible]	$0	[illegible]	0	$30,020,235	$0	[illegible]	13,300		$30,649,270	$8,167,464
2019	28,892	0		$0	$0	0		$0	$0	13,300		$31,875,969	$7,975,759
2020	29,560	1,687		$1,515,579	$356,072	2,100		$1,791,442	$420,883	13,300		$33,151,008	$7,788,535
2021	29,864	1,687		$1,576,202	$347,713	2,100		$1,863,100	$411,003	13,300		$34,477,048	$7,605,705
2022	30,169	1,687		$1,639,250	$339,551	2,100		$1,937,624	$401,356	13,300		$35,856,130	$7,427,166
2023	30,473	1,687		$1,704,820	$331,580	2,100		$2,015,129	$391,934	13,300		$37,290,375	$7,252,821
2024	30,778	1,687		$1,773,013	$323,797	2,100		$2,095,734	$382,734	13,300		$38,781,990	$7,082,567
2025	67,582	1,687		$1,843,933	[illegible]	2,100		$2,179,583	$373,740	13,300		$40,333,270	$6,918,309
2026	31,387	1,687		$1,917,690	$308,773	2,100		$2,266,746	$364,976	13,300		$41,946,601	$6,753,955
2027	31,691	1,687		$1,994,398	$301,525	2,100		$2,357,415	$356,408	13,300		$43,624,465	$6,595,411
2028	31,996	1,687		$2,074,174	$294,447	2,100		$2,451,712	$348,042	13,300		$45,369,443	$6,440,589
2029	32,300	1,687		$2,157,141	$287,535	2,100		$2,549,781	$339,872	13,300		$47,184,221	$6,289,402
2030	32,605	1,687		$2,243,427	$280,786	2,100		$2,651,772	$331,894	13,300		$49,071,590	$6,141,763
2031	32,579	1,687		$2,333,164	$274,194	2,100		$2,757,843	$324,103	13,300		$51,034,453	$5,997,590
2032	59,054	1,687		$2,426,490	$267,756	2,100		$2,868,156	$316,495	13,300		$53,075,831	$5,856,802
2033	32,528	1,687		$2,523,550	$261,472	2,100		$2,982,883	$309,065	13,300		$55,198,865	$5,719,318
2034	32,503	1,687		$2,624,492	$255,335	2,100		$3,102,198	$301,810	13,300		$57,406,819	$5,585,062
2035	32,477	1,687		$2,729,471	$249,341	2,100		$3,226,286	$294,726	13,300		$59,703,092	$5,453,957
2036	32,452	1,687		$2,838,650	$243,488	2,100		$3,355,337	$287,807	13,300		$62,091,216	$5,325,930
2037	32,426	1,687		$2,952,196	$237,772	2,100		$3,489,551	$281,051	13,300		$64,574,864	$5,200,906
2038	32,401	1,687		$3,070,284	$232,191	2,100		$3,629,133	$274,454	13,300		$67,157,859	$5,078,821
2039	58,875	1,687		$3,193,096	$226,740	2,100		[illegible]	[illegible]	13,300		[illegible]	[illegible]
2040	32,350	1,687		$3,320,819	$221,418	2,100		$3,925,270	$261,720	13,300		$72,637,940	$4,843,177
Subtotals:	1,121,094	35,427			$22,348,738	44,100			$23,233,742	399,000			$249,288,885
	12.6%	*0.4%*		Unit Cost ($/AF):	$631	*0.5%*		Unit Cost ($/AF):	$527	*4.5%*		Unit Cost ($/AF):	$625

Service Area "C" Resource Alternative 4 Present Worth

Year	Central County Industrial (Boiler Feed)				Surface Water Transfer				Spot Surface Water Transfer			
	Capital Cost (1995): $119,220,000; O&M Cost (1995): $1,460				Capital Cost (1995): -; O&M Cost (1995): $175				Capital Cost (1995): -; O&M Cost (1995): $300			
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	0		$0	$0	41,460		$14,107,491	$14,107,491
1998	0		$0	$0	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0	0		$0	$0
2004	0		$0	$0	0		$0	$0	44,604		$23,385,175	$16,177,207
2005	0		$0	$0	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0	0		$0	$0
2008	0	$99,255,032	$0	$49,648,582	0		$0	$0	0		$0	$0
2009	0	$103,225,233	$0	$48,483,122	0		$0	$0	0		$0	$0
2010	0		$0	$0	0		$0	$0	0		$0	$0
2011	10,200		$27,592,437	$11,550,255	148		$23,008	$9,527	26,500		$21,775,135	$9,017,089
2012	10,900		$30,998,888	$12,053,190	16		$8,168	$3,176	0		$0	$0
2013	11,500		$34,013,459	$12,418,155	84		$45,668	$16,673	0		$0	$0
2014	12,200		$37,527,198	$12,864,793	52		$30,108	$10,321	0		$0	$0
2015	12,200		$39,028,285	$12,562,803	720		$443,979	$142,912	0		$0	$0
2016	12,200		$40,589,417	$12,267,901	1,388		$911,526	$275,503	0		$0	$0
2017	12,200		$42,212,994	$11,979,922	2,058		$1,437,979	$408,094	0		$0	$0
2018	12,200		$43,901,513	$11,698,704	2,724		$2,029,019	$540,835	26,500		[illegible]	$9,017,089
2019	12,200		$45,657,574	$11,424,086	3,392		$2,690,819	$673,276	0		$0	$0
2020	12,200		$47,483,877	$11,155,915	273		$230,643	$54,188	0		$0	$0
2021	12,200		$49,383,232	$10,894,039	577		$519,163	$114,528	0		$0	$0
2022	12,200		$51,358,561	$10,638,310	882		$845,174	$175,068	0		$0	$0
2023	12,200		$53,412,904	$10,388,585	1,186		$1,210,352	$235,408	0		$0	$0
2024	12,200		$55,549,420	$10,144,721	1,491		$1,620,520	$295,948	0		$0	$0
2025	12,200		$57,771,396	$9,906,542	1,795		$2,077,738	$356,288	26,500		$52,584,213	$9,017,089
2026	12,200		$60,082,252	$9,674,033	2,100		$2,588,780	$416,828	0		$0	$0
2027	12,200		$62,485,542	$9,446,943	2,404		$3,156,167	$477,168	0		$0	$0
2028	12,200		$64,984,964	$9,225,184	2,709		$3,787,774	$537,708	0		$0	$0
2029	12,200		$67,584,363	$9,008,630	3,013		$4,486,667	$598,048	0		$0	$0
2030	12,200		$70,287,737	$8,797,160	3,318		$5,261,998	$658,588	0		$0	$0
2031	12,200		$73,099,247	$8,590,654	3,292		$5,560,115	$653,427	0		$0	$0
2032	12,200		$76,023,217	$8,388,998	3,267		$5,876,563	$648,465	26,500		$81,716,158	$9,017,089
2033	12,200		$79,064,145	$8,192,071	3,241		$6,208,721	$643,304	0		$0	$0
2034	12,200		$82,226,711	$7,999,769	3,216		$6,561,283	$638,342	0		$0	$0
2035	12,200		$85,515,779	$7,811,981	3,190		$6,931,274	$633,181	0		$0	$0
2036	12,200		$88,936,411	$7,628,601	3,165		$7,323,955	$628,219	0		$0	$0
2037	12,200		$92,493,867	$7,449,526	3,139		$7,735,936	$623,058	0		$0	$0
2038	12,200		$96,193,622	$7,274,654	3,114		$8,173,156	$618,096	0		$0	$0
2039	12,200		$100,041,367	$7,103,885	3,088		$8,631,735	$612,935	26,500		$126,084,254	$9,017,089
2040	12,200		$104,043,021	$6,937,130	3,063		$9,118,374	$607,973	0		$0	$0
Subtotals:	362,000			$393,608,894	62,003			$12,306,937	218,564			$74,370,141
	4.1%		Unit Cost ($/AF):	$1,087	*0.7%*		Unit Cost ($/AF purchased):	$198	*2.5%*		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	8,898,500		$1,107,864,824
		Unit Cost ($/AF):	$125
Totals (without CVP allocation):	1,651,809		$831,277,460
		Unit Cost ($/AF):	$503

C—100399

C-100400

Service Area "C" Resource Alternative 5 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 3 — Capital Cost (1995): - ; O&M Cost (1995): - — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project — Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] — Capital Cost (1995): - ; O&M Cost (1995): $56 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	167,700	[illegible]		[illegible]	[illegible]	125	165,015	123,761		$7,496,189	$7,496,189
1998	170,333	3,413		$2,070,000	$1,943,662	249	166,671	166,671		$10,499,025	$9,858,239
1999	172,967	4,267		$2,691,000	$2,372,545	374	168,326	168,326		$11,027,364	$9,722,378
2000	175,600	5,120		$3,358,000	$2,779,917	498	169,982	169,982		$11,561,309	$9,587,576
2001	177,840	6,247		$3,524,000	$2,739,287	623	170,970	170,970		$12,114,569	$9,416,934
2002	180,080	7,373		$3,698,000	$2,699,099	684	172,043	172,043		$12,678,224	$9,253,592
2003	182,320	8,500		$3,880,000	$2,659,096	706	173,114	173,114		$13,267,434	$9,092,625
2004	184,560	[illegible]		[illegible]	[illegible]	747	[illegible]	130,640		[illegible]	[illegible]
2005	186,800	10,753		$4,271,000	$2,580,671	789	175,258	175,258		$14,527,781	$8,778,138
2006	189,040	11,879		$4,480,000	$2,541,742	830	176,331	176,331		$15,201,394	$8,624,560
2007	191,280	13,006		$4,699,000	$2,503,280	830	177,444	177,444		$15,909,239	$8,475,266
2008	193,520	14,132		$4,929,000	$2,465,546	830	178,558	178,558		$16,649,483	$8,328,275
2009	195,760	15,259		$5,169,000	$2,427,791	830	179,671	179,671		$17,423,394	$8,183,470
2010	198,000	16,385		$5,421,000	$2,390,752	830	180,785	180,785		$18,232,680	$8,040,918
2011	199,150	17,512		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2012	200,300	18,638		$5,961,000	$2,317,795	830	180,832	166,000		$18,107,683	$7,040,747
2013	201,450	19,765		$6,250,000	$2,281,846	830	180,855	166,000		$18,831,990	$6,875,472
2014	202,600	20,891		$6,552,000	$2,246,108	830	180,879	166,000		$19,585,270	$6,714,076
2015	203,750	22,018		$6,869,000	$2,211,060	830	180,902	166,000		$20,368,681	$6,556,468
2016	204,900	23,144		$7,201,000	$2,176,458	830	180,926	166,000		$21,183,428	$6,402,561
2017	206,050	24,271		$7,548,000	$2,142,100	830	180,949	166,000		$22,030,765	$6,252,266
2018	207,200	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2019	208,350	26,524		$8,292,000	$2,074,760	830	180,996	166,000		$23,828,476	$5,962,177
2020	209,500	27,650		$8,691,000	$2,041,873	830	181,020	166,000		$24,781,615	$5,822,220
2021	210,060	27,741		$8,981,000	$1,981,226	830	181,489	166,000		$25,772,879	$5,685,548
2022	210,620	27,831		$9,282,000	$1,922,655	830	181,959	166,000		$26,803,794	$5,552,085
2023	211,180	27,922		$9,591,000	$1,865,409	830	182,428	166,000		$27,875,946	$5,421,754
2024	211,740	28,012		$9,911,000	$1,809,998	830	182,898	166,000		$28,990,984	$5,294,483
2025	212,300	28,103		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2026	212,860	28,193		$10,582,000	$1,703,841	830	183,837	166,000		$31,356,648	$5,048,833
2027	213,420	28,284		$10,933,000	$1,652,917	830	184,306	166,000		$32,610,914	$4,930,316
2028	213,980	28,374		$11,295,000	$1,603,424	830	184,776	166,000		$33,915,351	$4,814,581
2029	214,540	28,465		$11,669,000	$1,555,415	830	185,245	166,000		$35,271,965	$4,701,562
2030	215,100	28,555		$12,055,000	$1,508,795	830	185,715	166,000		$36,682,843	$4,591,197
2031	215,330	28,646		$12,453,000	$1,463,482	830	185,854	166,000		$38,150,157	$4,483,422
2032	215,560	28,735		[illegible]	[illegible]	830	185,994	139,500		[illegible]	[illegible]
2033	215,790	28,827		$13,288,000	$1,376,809	830	186,133	166,000		$41,263,210	$4,275,404
2034	216,020	28,917		$13,724,000	$1,335,197	830	186,273	166,000		$42,913,738	$4,175,042
2035	216,250	29,008		$14,175,000	$1,294,905	830	186,412	166,000		$44,630,288	$4,077,036
2036	216,480	29,098		$14,640,000	$1,255,759	830	186,552	166,000		$46,415,499	$3,981,331
2037	216,710	29,189		$15,119,000	$1,217,696	830	186,691	166,000		$48,272,119	$3,887,873
2038	216,940	29,279		$15,613,000	$1,180,735	830	186,831	166,000		$50,203,004	$3,796,608
2039	217,170	29,370		$16,122,000	$1,144,815	830	186,970	139,500		$43,876,216	$3,115,628
2040	217,400	29,460		$16,647,000	$1,109,949	830	187,110	166,000		$54,299,569	$3,620,456
Subtotals:	8,898,500	926,340			$86,328,865	33,825	7,938,335	7,191,055			$273,851,869
		10.4%		Unit Cost ($/AF avoided):	$93	*0.4%*	*89.2%*	*80.8%*		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100400

Service Area "C" Resource Alternative 5 Present Worth

		Surface Water Transfer				Spot Surface Water Transfer			
		Capital Cost (1995): -				Capital Cost (1995): -			
		O&M Cost (1995): $175				O&M Cost (1995): $300			
Year	Net Deficit (AF/yr)	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0
2004	[illegible]	0		$0	[illegible]	[illegible]		[illegible]	[illegible]
2005	0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0
2008	0	0		$0	$0	0		$0	$0
2009	0	0		$0	$0	0		$0	$0
2010	0	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	14,832	14,832		$7,571,486	$2,943,994	0		$0	$0
2013	14,855	14,855		$8,076,136	$2,948,560	0		$0	$0
2014	14,879	14,879		$8,614,981	$2,953,323	0		$0	$0
2015	14,902	14,902		$9,189,138	$2,957,889	0		$0	$0
2016	14,926	14,926		$9,802,193	$2,962,652	0		$0	$0
2017	14,949	14,949		$10,455,422	$2,967,218	0		$0	$0
2018	[illegible]	14,973		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	14,996	14,996		$11,896,085	$2,976,547	0		$0	$0
2020	15,020	15,020		$12,689,607	$2,981,310	0		$0	$0
2021	15,489	15,489		$13,936,420	$3,074,402	0		$0	$0
2022	15,959	15,959		$15,292,664	$3,167,692	0		$0	$0
2023	16,428	16,428		$16,765,317	$3,260,783	0		$0	$0
2024	16,898	16,898		$18,365,890	$3,354,073	0		$0	$0
2025	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2026	17,837	17,837		$21,988,606	$3,540,455	0		$0	$0
2027	18,306	18,306		$24,033,607	$3,633,546	0		$0	$0
2028	18,776	18,776		$26,252,954	$3,726,837	0		$0	$0
2029	19,245	19,245		$28,657,786	$3,819,928	0		$0	$0
2030	19,715	19,715		$31,265,912	$3,913,218	0		$0	$0
2031	19,854	19,854		$33,532,984	$3,940,808	0		$0	$0
2032	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2033	20,133	20,133		$38,568,401	$3,996,187	0		$0	$0
2034	20,273	20,273		$41,360,975	$4,023,975	0		$0	$0
2035	20,412	20,412		$44,351,460	$4,051,565	0		$0	$0
2036	20,552	20,552		$47,558,271	$4,079,354	0		$0	$0
2037	20,691	20,691		$50,992,119	$4,106,944	0		$0	$0
2038	20,831	20,831		$54,674,057	$4,134,732	0		$0	$0
2039	[illegible]	20,970		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	21,110	21,110		$62,843,249	$4,190,111	0		$0	$0
Subtotals:	747,281	529,960			$105,195,399	217,301			$73,940,298
	8.4%	*6.0%*		Unit Cost ($/AF purchased):	$198	*2.4%*		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	8,898,500		$539,316,430
		Unit Cost ($/AF):	$61
Totals (without CVP allocation):	1,707,448		$265,464,562
		Unit Cost ($/AF):	$155

C-100401

C—100401

C-100402

Service Area "C" Resource Alternative 6 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 3: Quantity (AF/yr)	Conservation Program 3: Escalated Capital Cost	Conservation Program 3: Escalated O&M Cost	Conservation Program 3: Total Present Worth Cost	CCCSD Zone 1 Project: Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c]: Quantity (AF/yr)	CVP Raw Water Allocation [c]: Escalated Capital Cost	CVP Raw Water Allocation [c]: Escalated O&M Cost	CVP Raw Water Allocation [c]: Total Present Worth Cost
		Capital Cost (1995): -						Capital Cost (1995): -			
		O&M Cost (1995): -						O&M Cost (1995): $56			
1997	167,700	2,560		$1,493,000	$1,493,000	125	165,015	123,761		$7,496,169	$7,496,169
1998	170,333	3,413		$2,070,000	$1,943,662	249	166,671	166,671		$10,499,025	$9,858,239
1999	172,967	4,267		$2,691,000	$2,372,545	374	168,326	168,326		$11,027,364	$9,722,378
2000	175,600	5,120		$3,358,000	$2,779,917	498	169,982	169,982		$11,581,309	$9,587,576
2001	177,840	6,247		$3,524,000	$2,739,287	623	170,970	170,970		$12,114,569	$9,416,934
2002	180,080	7,373		$3,698,000	$2,699,099	664	172,043	172,043		$12,678,224	$9,253,592
2003	182,320	8,500		$3,880,000	$2,659,096	706	173,114	173,114		$13,267,434	$9,092,625
2004	184,560	9,626		$4,071,000	[illegible]	747	174,187	130,640		$10,412,743	$6,700,664
2005	186,800	10,753		$4,271,000	$2,580,671	789	175,258	175,258		$14,527,781	$8,778,138
2006	189,040	11,879		$4,480,000	$2,541,742	830	176,331	176,331		$15,201,394	$8,624,560
2007	191,280	13,006		$4,699,000	$2,503,280	830	177,444	177,444		$15,909,239	$8,475,266
2008	193,520	14,132		$4,929,000	$2,465,546	830	178,558	178,558		$16,649,483	$8,328,275
2009	195,760	15,259		$5,169,000	$2,427,791	830	179,671	179,671		$17,423,394	$8,183,470
2010	198,000	16,385		$5,421,000	$2,390,752	830	180,785	180,785		$18,232,680	$8,040,918
2011	199,150	17,512		$5,684,000	[illegible]	830	180,808	139,500		[illegible]	$6,059,003
2012	200,300	18,638		$5,981,000	$2,317,795	830	180,832	166,000		$18,107,683	$7,040,747
2013	201,450	19,765		$6,250,000	$2,281,846	830	180,855	166,000		$18,831,990	$6,875,472
2014	202,600	20,891		$6,552,000	$2,246,108	830	180,879	166,000		$19,585,270	$6,714,076
2015	203,750	22,018		$6,869,000	$2,211,060	830	180,902	166,000		$20,368,681	$6,558,468
2016	204,900	23,144		$7,201,000	$2,176,458	830	180,926	166,000		$21,183,428	$6,402,561
2017	206,050	24,271		$7,548,000	$2,142,100	830	180,949	166,000		$22,030,765	$6,252,266
2018	207,200	25,397		$7,912,000	[illegible]	830	180,973	139,500		$19,254,358	$5,130,828
2019	208,350	26,524		$8,292,000	$2,074,760	830	180,996	166,000		$23,828,476	$5,962,177
2020	209,500	27,650		$8,691,000	$2,041,873	830	181,020	166,000		$24,781,615	$5,822,220
2021	210,060	27,741		$8,981,000	$1,981,226	830	181,489	166,000		$25,772,879	$5,685,548
2022	210,620	27,831		$9,282,000	$1,922,655	830	181,959	166,000		$26,803,794	$5,552,085
2023	211,180	27,922		$9,591,000	$1,865,409	830	182,428	166,000		$27,875,946	$5,421,754
2024	211,740	28,012		$9,911,000	$1,809,998	830	182,898	166,000		$28,990,984	$5,294,483
2025	212,300	28,103		$10,241,000	[illegible]	830	183,367	139,500		[illegible]	[illegible]
2026	212,860	28,193		$10,582,000	$1,703,841	830	183,837	166,000		$31,356,648	$5,048,833
2027	213,420	28,284		$10,933,000	$1,652,917	830	184,306	166,000		$32,610,914	$4,930,316
2028	213,980	28,374		$11,295,000	$1,603,424	830	184,776	166,000		$33,915,351	$4,814,581
2029	214,540	28,465		$11,669,000	$1,555,415	830	185,245	166,000		$35,271,965	$4,701,562
2030	215,100	28,555		$12,065,000	$1,508,795	830	185,715	166,000		$36,682,843	$4,591,197
2031	215,330	28,646		$12,453,000	$1,463,482	830	185,854	166,000		$38,150,157	$4,483,422
2032	215,560	28,736		$12,864,000	$1,419,514	830	185,994	139,500		$33,342,318	$3,679,252
2033	215,790	28,827		$13,288,000	$1,376,809	830	186,133	166,000		$41,263,210	$4,275,404
2034	216,020	28,917		$13,724,000	$1,335,197	830	186,273	166,000		$42,913,738	$4,175,042
2035	216,250	29,008		$14,175,000	$1,294,905	830	186,412	166,000		$44,630,288	$4,077,036
2036	216,480	29,098		$14,640,000	$1,255,759	830	186,552	166,000		$46,415,499	$3,981,331
2037	216,710	29,189		$15,119,000	$1,217,696	830	186,691	166,000		$48,272,119	$3,887,873
2038	216,940	29,279		$15,613,000	$1,180,735	830	186,831	166,000		$50,203,004	$3,796,608
2039	217,170	29,370		$16,122,000	$1,144,815	830	186,970	139,500		$43,676,218	$3,115,628
2040	217,400	29,460		$16,647,000	$1,109,949	830	187,110	166,000		$54,299,569	$3,820,458
Subtotals:	8,898,500	926,340			$86,328,865	33,825	7,938,335	7,191,055			$273,851,869
		10.4%		Unit Cost ($/AF avoided):	$93	*0.4%*	*89.2%*	*80.8%*		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100402

Service Area "C" Resource Alternative 6 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation Capital Cost (1995): $24,660,000 O&M Cost (1995): $337 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Central County Industrial (Cooling Towers) Capital Cost (1995): $48,460,000 O&M Cost (1995): $935 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	41,254	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0
2004	43,547	0		$0	$0	0		$0	$0
2005	0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0
2008	0	0	$20,530,358	$0	$10,269,536	0	$40,344,731	$0	$20,180,928
2009	0	0	$21,351,571	$0	$10,028,467	0	$41,958,520	$0	$19,707,198
2010	0	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		[illegible]	[illegible]	13,100		[illegible]	[illegible]
2012	14,832	1,687		$1,107,418	$430,594	13,100		$23,858,859	$9,276,957
2013	14,855	1,687		$1,151,715	$420,488	13,100		$24,813,214	$9,059,188
2014	14,879	1,687		$1,197,784	$410,615	13,100		$25,805,742	$8,846,531
2015	14,902	1,687		$1,245,695	$400,976	13,200		$27,042,842	$8,704,812
2016	14,926	1,687		$1,295,523	$391,564	13,200		$28,124,556	$8,500,474
2017	14,949	1,687		$1,347,344	$382,372	13,200		$29,249,538	$8,300,932
2018	[illegible]	1,687		[illegible]	[illegible]	13,200		$30,419,519	$8,108,074
2019	14,996	1,687		$1,457,287	$364,631	13,300		$31,875,969	$7,975,759
2020	15,020	1,687		$1,515,579	$356,072	13,300		$33,151,008	$7,788,535
2021	15,489	1,687		$1,576,202	$347,713	13,300		$34,477,048	$7,605,705
2022	15,959	1,687		$1,639,250	$339,551	13,300		$35,856,130	$7,427,168
2023	16,428	1,687		$1,704,820	$331,580	13,300		$37,290,375	$7,252,821
2024	16,898	1,687		$1,773,013	$323,797	13,300		$38,781,990	$7,082,567
2025	[illegible]	1,687		$1,843,933	$316,196	13,300		$40,333,270	[illegible]
2026	17,837	1,687		$1,917,690	$308,773	13,300		$41,946,601	$6,753,955
2027	18,306	1,687		$1,994,398	$301,525	13,300		$43,624,465	$6,595,411
2028	18,776	1,687		$2,074,174	$294,447	13,300		$45,369,443	$6,440,589
2029	19,245	1,687		$2,157,141	$287,535	13,300		$47,184,221	$6,289,402
2030	19,715	1,687		$2,243,427	$280,786	13,300		$49,071,590	$6,141,763
2031	19,854	1,687		$2,333,164	$274,194	13,300		$51,034,453	$5,997,590
2032	[illegible]	1,687		[illegible]	[illegible]	13,300		[illegible]	[illegible]
2033	20,133	1,687		$2,523,550	$261,472	13,300		$55,198,865	$5,719,318
2034	20,273	1,687		$2,624,492	$255,335	13,300		$57,406,819	$5,585,062
2035	20,412	1,687		$2,729,471	$249,341	13,300		$59,703,092	$5,453,957
2036	20,552	1,687		$2,838,650	$243,488	13,300		$62,091,216	$5,325,930
2037	20,691	1,687		$2,952,196	$237,772	13,300		$64,574,864	$5,200,908
2038	20,831	1,687		$3,070,284	$232,191	13,300		$67,157,859	$5,078,821
2039	47,470	1,687		[illegible]	[illegible]	13,300		[illegible]	[illegible]
2040	21,110	1,687		$3,320,819	$221,418	13,300		$72,637,940	$4,843,177
Subtotals:	747,281 *8.4%*	50,610 *0.6%*		Unit Cost ($/AF):	$29,871,265 $590	397,800 *4.5%*		Unit Cost ($/AF):	$248,474,206 $625

C-100403

C—100403

Service Area "C" Resource Alternative 6 Present Worth

Year	Surface Water Transfer				Spot Surface Water Transfer			
	Capital Cost (1995): -				Capital Cost (1995): -			
	O&M Cost (1995): $175				O&M Cost (1995): $300			
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	[illegible]		$12,037,310	$12,037,310
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0
2008	0		$0	$0	0		$0	$0
2009	0		$0	$0	0		$0	$0
2010	0		$0	$0	0		$0	$0
2011	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2012	45		$22,972	$8,932	0		$0	$0
2013	68		$36,969	$13,497	0		$0	$0
2014	92		$53,268	$18,261	0		$0	$0
2015	15		$9,250	$2,977	0		$0	$0
2016	39		$25,612	$7,741	0		$0	$0
2017	62		$43,363	$12,306	0		$0	$0
2018	[illegible]		[illegible]	[illegible]	26,500		$36,836,247	$7,017,059
2019	9		$7,140	$1,786	0		$0	$0
2020	33		$27,880	$6,550	0		$0	$0
2021	502		$451,681	$99,642	0		$0	$0
2022	972		$931,416	$192,932	0		$0	$0
2023	1,441		$1,470,588	$286,023	0		$0	$0
2024	1,911		$2,077,004	$379,313	0		$0	$0
2025	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	2,850		$3,513,345	$565,695	0		$0	$0
2027	3,319		$4,357,453	$658,786	0		$0	$0
2028	3,789		$5,297,851	$752,076	0		$0	$0
2029	4,258		$6,340,600	$845,168	0		$0	$0
2030	4,728		$7,498,110	$938,458	0		$0	$0
2031	4,867		$8,220,255	$966,048	0		$0	$0
2032	5,007		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2033	5,146		$9,858,093	$1,021,426	0		$0	$0
2034	5,286		$10,784,497	$1,049,215	0		$0	$0
2035	5,425		$11,787,511	$1,076,805	0		$0	$0
2036	5,565		$12,877,665	$1,104,593	0		$0	$0
2037	5,704		$14,057,273	$1,132,183	0		$0	$0
2038	5,844		$15,338,447	$1,159,972	0		$0	$0
2039	5,983		$16,723,956	$1,187,562	26,500		$126,984,254	$7,017,059
2040	6,123		$18,227,817	$1,215,350	0		$0	$0
Subtotals:	81,570			$16,190,778	217,301			$73,940,298
	0.9%		Unit Cost ($/AF purchased):	$198	2.4%		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	8,898,500		$728,657,281
		Unit Cost ($/AF):	$82
Totals (without CVP allocation):	1,707,446		$454,805,412
		Unit Cost ($/AF):	$266

C-100404

Service Area "E" Resource Alternative 1 Present Worth

		Conservation Program 1				CCCSD Zone 1 Project		Normal Year		Drought Year		CVP Raw Water Allocation [c]			
		Capital Cost (1995): -								Cutback: 25%		Capital Cost (1995): -			
		O&M Cost (1995): -										O&M Cost (1995): $56			
Year	Gross Demand (AF/yr)	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Contract (AF/yr) [c]	Net Deficit (AF/yr)	CVP Contract (AF/yr) [d]	Net Deficit (AF/yr)	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	175,800	960		$849,000	$849,000	125	174,415	195,000	0	[illegible]	43,604	[illegible]		$7,923,185	$7,923,185
1998	178,633	1,280		$1,177,000	$1,105,164	249	177,104	195,000	0	132,828	-	177,104		$11,156,224	$10,475,328
1999	181,767	1,600		$1,531,000	$1,349,820	374	179,793	195,000	0	134,845	-	179,793		$11,778,591	$10,384,704
2000	184,900	1,920		$1,910,000	$1,581,192	498	182,482	195,000	0	136,862	-	182,482		$12,432,966	$10,292,620
2001	188,350	2,217		$2,005,000	$1,558,533	623	185,510	195,000	0	139,133	-	185,510		$13,144,843	$10,217,790
2002	191,800	2,514		$2,104,000	$1,535,669	664	188,622	195,000	0	141,467	-	188,622		$13,899,966	$10,145,319
2003	195,250	2,811		$2,206,000	$1,513,218	706	191,733	195,000	0	143,800	-	191,733		$14,694,392	$10,070,568
2004	198,700	3,108		[illegible]	[illegible]	747	[illegible]	195,000	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	202,150	3,405		$2,431,000	$1,468,886	789	197,956	195,000	2,956	161,250	-	195,000		$16,164,268	$9,766,955
2006	205,600	3,702		$2,551,000	$1,447,318	830	201,068	195,000	6,068	161,250	-	195,000		$16,810,838	$9,537,683
2007	209,050	3,999		$2,676,000	$1,425,575	830	204,221	195,000	9,221	161,250	-	195,000		$17,483,272	$9,313,794
2008	212,500	4,296		$2,807,000	$1,404,096	830	207,374	195,000	12,374	161,250	-	195,000		$18,182,603	$9,095,160
2009	215,950	4,593		$2,945,000	$1,383,216	830	210,527	195,000	15,527	161,250	-	195,000		$18,909,907	$8,881,659
2010	219,400	4,890		$3,089,000	$1,362,301	830	213,680	195,000	18,680	161,250	-	195,000		$19,666,303	$8,673,169
2011	221,190	5,187		[illegible]	[illegible]	830	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	222,980	5,484		$3,397,000	$1,320,844	830	216,668	166,000	50,668	139,500	-	166,000		$18,107,683	$7,040,747
2013	224,770	5,781		$3,562,000	$1,300,470	830	218,159	166,000	52,159	139,500	-	166,000		$18,831,990	$6,875,472
2014	226,560	6,078		$3,735,000	$1,280,405	830	219,652	166,000	53,652	139,500	-	166,000		$19,585,270	$6,714,076
2015	228,350	6,375		$3,917,000	$1,260,842	830	221,145	166,000	55,145	139,500	-	166,000		$20,368,681	$6,556,468
2016	230,140	6,672		$4,106,000	$1,241,013	830	222,638	166,000	56,638	139,500	-	166,000		$21,183,428	$6,402,561
2017	231,930	6,969		$4,305,000	$1,221,746	830	224,131	166,000	58,131	139,500	-	166,000		$22,030,765	$6,252,286
2018	233,720	7,266		[illegible]	[illegible]	830	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	235,510	7,563		$4,731,000	$1,183,754	830	227,117	166,000	61,117	139,500	-	166,000		$23,828,476	$5,962,177
2020	237,300	7,860		$4,958,000	$1,164,838	830	228,610	166,000	62,610	139,500	-	166,000		$24,781,615	$5,822,220
2021	238,100	7,997		$5,108,000	$1,126,835	830	229,273	166,000	63,273	139,500	-	166,000		$25,772,879	$5,685,548
2022	238,900	8,133		$5,262,000	$1,089,960	830	229,937	166,000	63,937	139,500	-	166,000		$26,803,794	$5,552,085
2023	239,700	8,270		$5,420,000	$1,054,167	830	230,600	166,000	64,600	139,500	-	166,000		$27,875,946	$5,421,754
2024	240,500	8,406		$5,582,000	$1,019,414	830	231,264	166,000	65,264	139,500	-	166,000		$28,990,984	$5,294,483
2025	241,300	8,543		$5,749,000	[illegible]	830	231,927	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2026	242,100	8,679		$5,920,000	$953,198	830	232,591	166,000	66,591	139,500	-	166,000		$31,358,648	$5,048,833
2027	242,900	8,816		$6,095,000	$921,479	830	233,254	166,000	67,254	139,500	-	166,000		$32,610,914	$4,930,316
2028	243,700	8,952		$6,275,000	$890,791	830	233,918	166,000	67,918	139,500	-	166,000		$33,915,351	$4,814,581
2029	244,500	9,089		$6,460,000	$861,083	830	234,581	166,000	68,581	139,500	-	166,000		$35,271,965	$4,701,562
2030	245,300	9,225		$6,649,000	$832,184	830	235,245	166,000	69,245	139,500	-	166,000		$36,682,843	$4,591,197
2031	245,530	9,362		$6,843,000	$804,192	830	235,338	166,000	69,338	139,500	-	166,000		$38,150,157	$4,483,422
2032	245,760	9,498		$7,042,000	$777,069	830	235,432	166,000	[illegible]	139,500	[illegible]	[illegible]		[illegible]	[illegible]
2033	245,990	9,635		$7,246,000	$750,780	830	235,525	166,000	69,525	139,500	-	166,000		$41,263,210	$4,275,404
2034	246,220	9,771		$7,455,000	$725,291	830	235,619	166,000	69,619	139,500	-	166,000		$42,913,738	$4,175,042
2035	246,450	9,908		$7,670,000	$700,665	830	235,712	166,000	69,712	139,500	-	166,000		$44,630,288	$4,077,036
2036	246,680	10,044		$7,889,000	$676,686	830	235,806	166,000	69,806	139,500	-	166,000		$46,415,499	$3,981,331
2037	246,910	10,181		$8,114,000	$653,508	830	235,899	166,000	69,899	139,500	-	166,000		$48,272,119	$3,887,873
2038	247,140	10,317		$8,344,000	$631,016	830	235,993	166,000	69,993	139,500	-	166,000		$50,203,004	$3,796,608
2039	247,370	10,454		$8,579,000	$609,191	830	236,066	166,000	[illegible]	139,500	[illegible]	139,500		[illegible]	$3,116,628
2040	247,600	10,590		$8,820,000	$588,079	830	236,180	166,000	70,180	139,500	-	166,000		$54,299,569	$3,620,456
Subtotals:	9,934,650	292,400			$48,644,200	33,825	9,608,425					7,399,689			$284,566,338
		2.9%		Unit Cost ($/AF avoided):	$166	0.3%	96.7%					74.5%		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100405

Service Area "E" Resource Alternative 1 Present Worth

Year	Net Deficit (AF/yr)	ECCID Capital Cost (1995): - O&M Cost (1995): $63 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $175 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $300 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	[illegible]	[illegible]		[illegible]	[illegible]	0		[illegible]	[illegible]	0		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	[illegible]	[illegible]		[illegible]	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	2,956	2,956		$186,228	$112,525	0		$0	$0	0		$0	$0
2006	6,068	6,068		$382,284	$216,890	0		$0	$0	0		$0	$0
2007	9,221	9,221		$580,923	$309,473	0		$0	$0	0		$0	$0
2008	12,374	12,374		$779,562	$389,946	0		$0	$0	0		$0	$0
2009	15,527	15,000		$945,000	$443,850	527		$222,712	$104,604	0		$0	$0
2010	18,680	18,680		$1,176,840	$519,006	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	50,666	21,000		$1,323,000	$514,417	29,666		$15,143,992	$5,888,385	0		$0	$0
2013	52,159	21,000		$1,323,000	$483,021	31,159		$16,940,043	$6,184,730	0		$0	$0
2014	53,652	21,000		$1,323,000	$453,541	32,652		$18,905,596	$6,481,075	0		$0	$0
2015	55,145	21,000		$1,323,000	$425,860	34,145		$21,055,101	$6,777,420	0		$0	$0
2016	56,638	21,000		$1,323,000	$399,869	35,638		$23,404,164	$7,073,764	0		$0	$0
2017	58,131	21,000		$1,323,000	$375,463	37,131		$25,969,648	$7,370,109	0		$0	$0
2018	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	61,117	21,000		$1,323,000	$331,031	40,117		$31,824,170	$7,962,798	0		$0	$0
2020	62,610	21,000		$1,323,000	$310,827	41,610		$35,154,098	$8,259,143	0		$0	$0
2021	63,273	21,000		$1,323,000	$291,856	42,273		$38,035,657	$8,390,741	0		$0	$0
2022	63,937	21,000		$1,323,000	$274,044	42,937		$41,144,251	$8,522,538	0		$0	$0
2023	64,600	21,000		$1,323,000	$257,318	43,600		$44,495,240	$8,654,137	0		$0	$0
2024	65,264	21,000		$1,323,000	$241,613	44,264		$48,109,111	$8,785,934	0		$0	$0
2025	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2026	66,591	21,000		$1,323,000	$213,020	45,591		$56,202,419	$9,049,329	0		$0	$0
2027	67,254	21,000		$1,323,000	$200,019	46,254		$60,726,017	$9,180,928	0		$0	$0
2028	67,918	21,000		$1,323,000	$187,811	46,918		$65,601,625	$9,312,724	0		$0	$0
2029	68,581	21,000		$1,323,000	$176,349	47,581		$70,853,006	$9,444,323	0		$0	$0
2030	69,245	21,000		$1,323,000	$165,586	48,245		$76,511,485	$9,576,120	0		$0	$0
2031	69,338	21,000		$1,323,000	$155,480	48,338		$81,641,807	$9,594,579	0		$0	$0
2032	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2033	69,525	21,000		$1,323,000	$137,080	48,525		$92,958,410	$9,631,697	0		$0	$0
2034	69,619	21,000		$1,323,000	$128,714	48,619		$99,192,486	$9,650,355	0		$0	$0
2035	69,712	21,000		$1,323,000	$120,858	48,712		$105,842,069	$9,668,814	0		$0	$0
2036	69,806	21,000		$1,323,000	$113,482	48,806		$112,939,324	$9,687,472	0		$0	$0
2037	69,899	21,000		$1,323,000	$106,555	48,899		$120,509,574	$9,705,932	0		$0	$0
2038	69,993	21,000		$1,323,000	$100,052	48,993		$128,589,414	$9,724,590	0		$0	$0
2039	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	70,180	21,000		$1,323,000	$88,212	49,180		$146,406,016	$9,761,707	0		$0	$0
Subtotals:	2,208,736	717,299			$10,723,087	1,289,622			$255,976,265	201,815			$69,671,086
	22.2%	7.2%	Unit Cost ($/AF purchased):		$15	13.0%	Unit Cost ($/AF purchased):		$198	2.0%	Unit Cost ($/AF purchased):		$340

Totals (with CVP allocation):	9,934,650		$668,580,975
		Unit Cost ($/AF):	$67
Totals (without CVP allocation):	2,534,961		$384,014,637
		Unit Cost ($/AF):	$151

C-100407

Service Area "E" Resource Alternative 2 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 — Capital Cost (1995): - ; O&M Cost (1995): - — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project — Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] — Capital Cost (1995): - ; O&M Cost (1995): $56 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	176,500	[illegible]		$1,103,000	$1,103,000	125	[illegible]	[illegible]		[illegible]	[illegible]
1998	178,633	2,447		$1,530,000	$1,436,620	249	175,937	175,937		$11,062,712	$10,406,302
1999	181,767	3,058		$1,989,000	$1,753,620	374	178,335	178,335		$11,683,075	$10,300,491
2000	184,900	3,670		$2,482,000	$2,054,721	498	180,732	180,732		$12,313,734	$10,193,914
2001	188,350	4,235		$2,608,000	$2,027,259	623	183,492	183,492		$13,001,851	$10,106,639
2002	191,800	4,800		$2,740,000	$1,999,873	664	186,336	186,336		$13,731,506	$10,022,363
2003	195,250	5,365		$2,878,000	$1,972,392	706	189,179	189,179		$14,498,653	$9,936,422
2004	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	202,150	6,495		$3,175,000	$1,918,434	789	194,866	194,866		$16,153,160	$9,760,243
2006	265,600	7,060		$3,334,000	$1,891,558	830	197,710	195,000		$16,810,838	$9,537,683
2007	209,050	7,625		$3,501,000	$1,865,074	830	200,595	195,000		$17,483,272	$9,313,794
2008	212,500	8,190		$3,676,000	$1,838,780	830	203,480	195,000		$18,182,603	$9,095,160
2009	215,950	8,755		$3,860,000	$1,812,976	830	206,365	195,000		$18,909,907	$8,881,859
2010	219,400	9,320		$4,052,000	$1,787,000	830	209,250	195,000		$19,666,303	$8,673,169
2011	221,190	[illegible]		$4,254,000	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2012	222,980	10,450		$4,465,000	$1,736,110	830	211,700	166,000		$18,107,683	$7,040,747
2013	224,770	11,015		$4,686,000	$1,710,837	830	212,925	166,000		$18,831,990	$6,875,472
2014	226,560	11,580		$4,917,000	$1,685,609	830	214,150	166,000		$19,585,270	$6,714,078
2015	228,350	12,145		$5,160,000	$1,660,951	830	215,375	166,000		$20,368,681	$6,556,468
2016	230,140	12,710		$5,414,000	$1,636,348	830	216,600	166,000		$21,183,428	$6,402,561
2017	231,930	13,275		$5,681,000	$1,612,251	830	217,825	166,000		$22,030,765	$6,252,266
2018	233,720	13,840		$5,960,000	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2019	235,510	14,405		$6,252,000	$1,564,327	830	220,275	166,000		$23,828,476	$5,962,177
2020	237,300	14,970		$6,558,000	$1,540,744	830	221,500	166,000		$24,781,615	$5,822,220
2021	238,100	15,267		$6,770,000	$1,493,475	830	222,003	166,000		$25,772,879	$5,685,548
2022	238,900	15,564		$6,989,000	$1,447,688	830	222,506	166,000		$26,803,794	$5,552,085
2023	239,700	15,861		$7,215,000	$1,403,287	830	223,009	166,000		$27,875,946	$5,421,754
2024	240,500	16,158		$7,447,000	$1,360,010	830	223,512	166,000		$28,990,984	$5,294,483
2025	241,300	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2026	242,100	16,752		$7,934,000	$1,277,478	830	224,518	166,000		$31,356,648	$5,048,833
2027	242,900	17,049		$8,188,000	$1,237,912	830	225,021	166,000		$32,610,914	$4,930,316
2028	243,700	17,346		$8,450,000	$1,199,551	830	225,524	166,000		$33,915,351	$4,814,581
2029	244,500	17,643		$8,719,000	$1,162,196	830	226,027	166,000		$35,271,965	$4,701,562
2030	245,300	17,940		$8,997,000	$1,126,058	830	226,530	166,000		$36,682,843	$4,591,197
2031	245,530	18,237		$9,283,000	$1,090,942	830	226,463	166,000		$38,150,157	$4,483,422
2032	245,760	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2033	245,990	18,831		$9,881,000	$1,023,800	830	226,329	166,000		$41,263,210	$4,275,404
2034	246,220	19,128		$10,193,000	$991,669	830	226,262	166,000		$42,913,738	$4,175,042
2035	246,450	19,425		$10,514,000	$960,468	830	226,195	166,000		$44,630,288	$4,077,036
2036	246,680	19,722		$10,845,000	$930,240	830	226,128	166,000		$46,415,499	$3,981,331
2037	246,910	20,019		$11,185,000	$900,848	830	226,061	166,000		$48,272,119	$3,887,873
2038	247,140	20,316		$11,535,000	$872,336	830	225,994	166,000		$50,203,004	$3,796,608
2039	247,370	20,613		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2040	247,600	20,910		$12,266,000	$817,843	830	225,860	166,000		$54,299,569	$3,620,456
Subtotals:	9,934,650	564,830			$64,419,180	33,825	9,335,995	7,386,649			$283,791,123
		5.7%		Unit Cost ($/AF avoided):	$114	0.3%	94.0%	74.3%		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100407

Service Area "E" Resource Alternative 2 Present Worth

Year	Net Deficit (AF/yr)	ECCID Capital Cost (1995): - O&M Cost (1995): $63 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $175 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $300 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	[illegible]	[illegible]		[illegible]	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	[illegible]	[illegible]		[illegible]	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	2,710	2,710		$170,730	$96,864	0		$0	$0	0		$0	$0
2007	5,595	5,595		$352,485	$187,778	0		$0	$0	0		$0	$0
2008	8,480	8,480		$534,240	$267,233	0		$0	$0	0		$0	$0
2009	11,365	11,365		$715,995	$336,291	0		$0	$0	0		$0	$0
2010	14,250	14,250		$897,750	$395,923	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	45,700	21,000		$1,323,000	$514,417	24,700		$12,608,933	$4,902,688	0		$0	$0
2013	46,925	21,000		$1,323,000	$483,021	25,925		$14,094,503	$5,145,837	0		$0	$0
2014	48,150	21,000		$1,323,000	$453,541	27,150		$15,719,924	$5,388,987	0		$0	$0
2015	49,375	21,000		$1,323,000	$425,860	28,375		$17,497,100	$5,632,136	0		$0	$0
2016	50,600	21,000		$1,323,000	$399,869	29,600		$19,438,893	$5,875,286	0		$0	$0
2017	51,825	21,000		$1,323,000	$375,463	30,825		$21,559,193	$6,118,435	0		$0	$0
2018	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	54,275	21,000		$1,323,000	$331,031	33,275		$26,396,521	$6,604,734	0		$0	$0
2020	55,500	21,000		$1,323,000	$310,827	34,500		$29,147,233	$6,847,883	0		$0	$0
2021	56,003	21,000		$1,323,000	$291,856	35,003		$31,494,384	$6,947,724	0		$0	$0
2022	56,506	21,000		$1,323,000	$274,044	35,506		$34,023,517	$7,047,564	0		$0	$0
2023	57,009	21,000		$1,323,000	$257,318	36,009		$36,748,374	$7,147,404	0		$0	$0
2024	57,512	21,000		$1,323,000	$241,613	36,512		$39,683,713	$7,247,244	0		$0	$0
2025	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2026	58,518	21,000		$1,323,000	$213,020	37,518		$46,250,406	$7,446,924	0		$0	$0
2027	59,021	21,000		$1,323,000	$200,019	38,021		$49,917,064	$7,546,765	0		$0	$0
2028	59,524	21,000		$1,323,000	$187,811	38,524		$53,864,977	$7,646,605	0		$0	$0
2029	60,027	21,000		$1,323,000	$176,349	39,027		$58,115,219	$7,746,445	0		$0	$0
2030	60,530	21,000		$1,323,000	$165,586	39,530		$62,690,414	$7,846,285	0		$0	$0
2031	60,483	21,000		$1,323,000	$155,480	39,483		$66,652,129	$7,832,986	0		$0	$0
2032	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2033	60,329	21,000		$1,323,000	$137,080	39,329		$75,341,810	$7,806,389	0		$0	$0
2034	60,262	21,000		$1,323,000	$128,714	39,262		$80,102,334	$7,793,090	0		$0	$0
2035	60,195	21,000		$1,323,000	$120,858	39,195		$85,163,407	$7,779,791	0		$0	$0
2036	60,128	21,000		$1,323,000	$113,482	39,128		$90,543,988	$7,766,492	0		$0	$0
2037	60,061	21,000		$1,323,000	$106,555	39,061		$96,264,228	$7,753,193	0		$0	$0
2038	59,994	21,000		$1,323,000	$100,052	38,994		$102,345,551	$7,739,895	0		$0	$0
2039	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	59,860	21,000		$1,323,000	$88,212	38,860		$115,683,973	$7,713,297	0		$0	$0
Subtotals:	1,950,446 19.6%	695,400 7.0%	Unit Cost ($/AF purchased):		$10,015,485 $14	1,054,155 10.6%	Unit Cost ($/AF purchased):		$209,239,567 $198	200,891 2.0%	Unit Cost ($/AF purchased):		$68,356,593 $340

Totals (with CVP allocation):	9,934,650	Unit Cost ($/AF):	$635,820,949 $64
Totals (without CVP allocation):	2,549,101	Unit Cost ($/AF):	$352,029,825 $138

Service Area "E" Resource Alternative 3 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 Quantity (AF/yr)	Conservation Program 2 Escalated Capital Cost	Conservation Program 2 Escalated O&M Cost	Conservation Program 2 Total Present Worth Cost	CCCSD Zone 1 Project Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] Quantity (AF/yr)	CVP Raw Water Allocation [c] Escalated Capital Cost	CVP Raw Water Allocation [c] Escalated O&M Cost	CVP Raw Water Allocation [c] Total Present Worth Cost
		Capital Cost (1995): - O&M Cost (1995): -						Capital Cost (1995): - O&M Cost (1995): $56			
1997	176,500	[illegible]		[illegible]	[illegible]	125	[illegible]	[illegible]		[illegible]	[illegible]
1998	178,633	2,447		$1,530,000	$1,436,620	249	175,937	175,937		$11,082,712	$10,406,302
1999	181,767	3,058		$1,989,000	$1,753,620	374	178,335	178,335		$11,683,075	$10,300,491
2000	184,900	3,670		$2,482,000	$2,054,721	498	180,732	180,732		$12,313,734	$10,193,914
2001	188,350	4,235		$2,608,000	$2,027,259	623	183,492	183,492		$13,001,851	$10,106,639
2002	191,800	4,800		$2,740,000	$1,999,873	664	186,336	186,336		$13,731,506	$10,022,363
2003	195,250	5,365		$2,878,000	$1,972,392	706	189,179	189,179		$14,498,653	$9,936,422
2004	198,700	[illegible]		[illegible]	[illegible]	747	[illegible]	[illegible]		[illegible]	[illegible]
2005	202,150	6,495		$3,175,000	$1,918,434	789	194,866	194,866		$16,153,180	$9,760,243
2006	205,600	7,060		$3,334,000	$1,891,556	830	197,710	195,000		$16,810,838	$9,537,683
2007	209,050	7,625		$3,501,000	$1,865,074	830	200,595	195,000		$17,483,272	$9,313,794
2008	212,500	8,190		$3,676,000	$1,838,780	830	203,480	195,000		$18,182,603	$9,095,160
2009	215,950	8,755		$3,860,000	$1,812,976	830	206,365	195,000		$18,909,907	$8,881,659
2010	219,400	9,320		$4,052,000	$1,787,000	830	209,250	195,000		$19,666,303	$8,673,169
2011	222,850	[illegible]		[illegible]	[illegible]	830	[illegible]	[illegible]		[illegible]	[illegible]
2012	222,980	10,450		$4,465,000	$1,736,110	830	211,700	168,000		$18,107,683	$7,040,747
2013	224,770	11,015		$4,686,000	$1,710,837	830	212,925	168,000		$18,831,990	$6,875,472
2014	226,560	11,580		$4,917,000	$1,685,609	830	214,150	168,000		$19,585,270	$6,714,076
2015	228,350	12,145		$5,160,000	$1,660,951	830	215,375	168,000		$20,368,681	$6,556,468
2016	230,140	12,710		$5,414,000	$1,636,348	830	216,600	168,000		$21,183,428	$6,402,561
2017	231,930	13,275		$5,681,000	$1,612,251	830	217,825	168,000		$22,030,765	$6,252,266
2018	233,720	[illegible]		[illegible]	[illegible]	830	[illegible]	[illegible]		[illegible]	[illegible]
2019	235,510	14,405		$6,252,000	$1,564,327	830	220,275	168,000		$23,828,476	$5,962,177
2020	237,300	14,970		$6,558,000	$1,540,744	830	221,500	168,000		$24,781,615	$5,822,220
2021	238,100	15,267		$6,770,000	$1,493,475	830	222,003	168,000		$25,772,879	$5,685,548
2022	238,900	15,564		$6,989,000	$1,447,588	830	222,506	168,000		$26,803,794	$5,552,085
2023	239,700	15,861		$7,215,000	$1,403,287	830	223,009	168,000		$27,875,946	$5,421,754
2024	240,500	16,158		$7,447,000	$1,360,010	830	223,512	168,000		$28,990,984	$5,294,483
2025	241,300	[illegible]		[illegible]	[illegible]	830	[illegible]	[illegible]		[illegible]	[illegible]
2026	242,100	16,752		$7,934,000	$1,277,478	830	224,518	168,000		$31,356,648	$5,048,833
2027	242,900	17,049		$8,188,000	$1,237,912	830	225,021	168,000		$32,610,914	$4,930,316
2028	243,700	17,346		$8,450,000	$1,199,551	830	225,524	168,000		$33,915,351	$4,814,581
2029	244,500	17,643		$8,719,000	$1,162,196	830	226,027	168,000		$35,271,965	$4,701,562
2030	245,300	17,940		$8,997,000	$1,126,058	830	226,530	168,000		$36,682,843	$4,591,197
2031	245,530	18,237		$9,283,000	$1,090,942	830	226,483	168,000		$38,150,157	$4,483,422
2032	245,760	[illegible]		[illegible]	[illegible]	830	[illegible]	[illegible]		[illegible]	[illegible]
2033	245,990	18,831		$9,881,000	$1,023,800	830	226,329	168,000		$41,263,210	$4,275,404
2034	246,220	19,128		$10,193,000	$991,669	830	226,262	168,000		$42,913,738	$4,175,042
2035	246,450	19,425		$10,514,000	$960,458	830	226,195	168,000		$44,630,288	$4,077,036
2036	246,680	19,722		$10,845,000	$930,240	830	226,128	168,000		$46,415,499	$3,981,331
2037	246,910	20,019		$11,185,000	$900,848	830	226,061	168,000		$48,272,119	$3,887,873
2038	247,140	20,316		$11,535,000	$872,336	830	225,994	168,000		$50,203,004	$3,796,608
2039	247,370	20,613		$11,895,000	$844,729	830	225,927	168,000		$52,211,124	$3,707,521
2040	247,600	20,910		$12,266,000	$817,843	830	225,860	168,000		$54,299,569	$3,620,456
Subtotals:	9,934,650	564,830			$64,419,180	33,825	9,335,995	7,385,549			$283,791,123
		5.7%	Unit Cost ($/AF avoided):		$114	0.3%	94.0%	74.3%	Unit Cost ($/AF purchased):		$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 168,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100409

Service Area "E" Resource Alternative 3 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation Capital Cost (1995): $24,660,000 O&M Cost (1995): $337 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation Capital Cost (1995): $72,940,000 O&M Cost (1995): $320 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	ECCID Capital Cost (1995): - O&M Cost (1995): $63 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	43,355	0		$0	$0	0		$0	$0	21,000		$504,000	$504,000
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	2,000	0		$0	$0	0		$0	$0	2,000		$48,000	$48,000
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	2,710	0		$0	$0	0		$0	$0	2,710		$170,730	$98,864
2007	5,595	0		$0	$0	0		$0	$0	5,595		$352,485	$187,778
2008	8,480	0		$0	$0	0		$0	$0	8,480		$534,240	$267,233
2009	11,365	0		$0	$0	0		$0	$0	11,365		$715,995	$336,291
2010	14,250	0		$0	$0	0		$0	$0	14,250		$897,750	$395,923
2011	17,375	0		$0	$0	0		$0	$0	17,000		$1,071,000	$447,855
2012	45,700	0		$0	$0	0		$0	$0	21,000		$1,323,000	$514,417
2013	46,925	0		$0	$0	0		$0	$0	21,000		$1,323,000	$483,021
2014	48,150	0		$0	$0	0		$0	$0	21,000		$1,323,000	$453,541
2015	49,375	0		$0	$0	0		$0	$0	21,000		$1,323,000	$425,860
2016	50,600	0	$28,097,210	$0	$8,492,209	0	$83,106,671	$0	$25,118,479	21,000		$1,323,000	$399,869
2017	51,825	0	$29,221,099	$0	$8,292,861	0	$86,430,938	$0	$24,528,844	21,000		$1,323,000	$375,463
2018	53,050	0		$0	$0	0		$0	$0	21,000		$1,323,000	$352,549
2019	54,275	1,687		$1,457,287	$364,631	6,280		$5,151,216	$1,288,898	21,000		$1,323,000	$331,031
2020	55,500	1,687		$1,515,579	$356,072	6,280		$5,357,265	$1,258,642	21,000		$1,323,000	$310,827
2021	56,003	1,687		$1,576,202	$347,713	6,280		$5,571,555	$1,229,096	21,000		$1,323,000	$291,856
2022	56,506	1,687		$1,639,250	$339,551	6,280		$5,794,417	$1,200,244	21,000		$1,323,000	$274,044
2023	57,009	1,687		$1,704,820	$331,580	6,280		$6,026,194	$1,172,069	21,000		$1,323,000	$257,318
2024	57,512	1,687		$1,773,013	$323,797	6,280		$6,267,242	$1,144,556	21,000		$1,323,000	$241,613
2025	58,015	1,687		$1,843,933	$316,196	6,280		$6,517,932	$1,117,688	21,000		$1,323,000	$226,867
2026	58,518	1,687		$1,917,690	$308,773	6,280		$6,778,649	$1,091,452	21,000		$1,323,000	$213,020
2027	59,021	1,687		$1,994,398	$301,525	6,280		$7,049,795	$1,065,831	21,000		$1,323,000	$200,019
2028	59,524	1,687		$2,074,174	$294,447	6,280		$7,331,787	$1,040,811	21,000		$1,323,000	$187,811
2029	60,027	1,687		$2,157,141	$287,535	6,280		$7,625,058	$1,016,379	21,000		$1,323,000	$176,349
2030	60,530	1,687		$2,243,427	$280,786	6,280		$7,930,060	$992,520	21,000		$1,323,000	$165,586
2031	60,463	1,687		$2,333,164	$274,194	6,280		$8,247,263	$969,222	21,000		$1,323,000	$155,480
2032	59,896	1,687		$2,426,490	$267,755	6,280		$8,577,153	$946,470	21,000		$1,323,000	$145,990
2033	60,329	1,687		$2,523,550	$261,472	6,280		$8,920,240	$924,253	21,000		$1,323,000	$137,080
2034	60,262	1,687		$2,624,492	$255,335	6,280		$9,277,049	$902,556	21,000		$1,323,000	$128,714
2035	60,195	1,687		$2,729,471	$249,341	6,280		$9,648,131	$881,370	21,000		$1,323,000	$120,858
2036	60,128	1,687		$2,838,650	$243,488	6,280		$10,034,056	$860,680	21,000		$1,323,000	$113,482
2037	60,061	1,687		$2,952,196	$237,772	6,280		$10,435,419	$840,476	21,000		$1,323,000	$106,555
2038	59,994	1,687		$3,070,284	$232,191	6,280		$10,852,835	$820,747	21,000		$1,323,000	$100,052
2039	59,927	1,687		$3,193,093	$226,740	6,280		$11,286,949	$801,481	21,000		$1,323,000	$93,946
2040	59,860	1,687		$3,320,819	$221,418	6,280		$11,738,427	$782,667	21,000		$1,323,000	$88,212
Subtotals:	1,950,446	37,114			$23,107,384	138,160			$71,995,431	695,400			$10,015,485
	19.6%	0.4%		Unit Cost ($/AF):	$623	1.4%		Unit Cost ($/AF):	$521	7.0%		Unit Cost ($/AF purchased):	$14

C—100410

C-100411

Service Area "E" Resource Alternative 3 Present Worth

Year	Surface Water Transfer Quantity (AF/yr)	Surface Water Transfer Escalated Capital Cost	Surface Water Transfer Escalated O&M Cost	Surface Water Transfer Total Present Worth Cost	Spot Surface Water Transfer Quantity (AF/yr)	Spot Surface Water Transfer Escalated Capital Cost	Spot Surface Water Transfer Escalated O&M Cost	Spot Surface Water Transfer Total Present Worth Cost
	Capital Cost (1995):	-	O&M Cost (1995): $175		Capital Cost (1995):	-	O&M Cost (1995): $300	
1997	0		$0	$0	35,385		$12,040,365	$12,040,365
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	0		$0	$0	33,006		$17,462,187	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0
2008	0		$0	$0	0		$0	$0
2009	0		$0	$0	0		$0	$0
2010	0		$0	$0	0		$0	$0
2011	23,475		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	24,700		$12,608,933	$4,902,688	0		$0	$0
2013	25,925		$14,094,503	$5,145,837	0		$0	$0
2014	27,150		$15,719,924	$5,388,987	0		$0	$0
2015	28,375		$17,497,100	$5,632,136	0		$0	$0
2016	29,600		$19,438,893	$5,875,286	0		$0	$0
2017	30,825		$21,559,193	$6,118,435	0		$0	$0
2018	32,050		$23,873,003	[illegible]	26,500		[illegible]	[illegible]
2019	25,308		$20,076,429	$5,023,369	0		$0	$0
2020	26,533		$22,416,335	$5,266,519	0		$0	$0
2021	27,036		$24,325,977	$5,366,359	0		$0	$0
2022	27,539		$26,389,164	$5,466,199	0		$0	$0
2023	28,042		$28,617,787	$5,566,039	0		$0	$0
2024	28,545		$31,024,638	$5,665,879	0		$0	$0
2025	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	29,551		$36,429,069	$5,865,560	0		$0	$0
2027	30,054		$39,457,338	$5,965,400	0		$0	$0
2028	30,557		$42,725,369	$6,065,240	0		$0	$0
2029	31,060		$46,251,536	$6,165,080	0		$0	$0
2030	31,563		$50,055,591	$6,264,920	0		$0	$0
2031	31,496		$53,196,043	$6,251,621	0		$0	$0
2032	31,429		$56,533,269	$6,238,323	26,500		$81,715,156	[illegible]
2033	31,362		$60,079,581	$6,225,024	0		$0	$0
2034	31,295		$63,848,060	$6,211,725	0		$0	$0
2035	31,228		$67,852,606	$6,198,426	0		$0	$0
2036	31,161		$72,107,984	$6,185,127	0		$0	$0
2037	31,094		$76,629,884	$6,171,829	0		$0	$0
2038	31,027		$81,434,975	$6,158,530	0		$0	$0
2039	30,960		$86,540,987	$6,145,231	26,500		$126,984,254	[illegible]
2040	30,893		$91,966,675	$6,131,932	0		$0	$0
Subtotals:	878,881			$174,448,540	200,891			$68,356,593
	8.8%		Unit Cost ($/AF purchased):	$198	2.0%		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	9,934,650		$696,133,737
		Unit Cost ($/AF):	$70
Totals (without CVP allocation):	2,549,101		$412,342,613
		Unit Cost ($/AF):	$162

C-100411

C-100412

Service Area "E" Resource Alternative 4 Present Worth

Conservation Program 2 — Capital Cost (1995): - ; O&M Cost (1995): -

CVP Raw Water Allocation [c] — Capital Cost (1995): - ; O&M Cost (1995): $56

Year	Gross Demand (AF/yr)	Conservation Program 2: Quantity (AF/yr)	Conservation Program 2: Escalated Capital Cost	Conservation Program 2: Escalated O&M Cost	Conservation Program 2: Total Present Worth Cost	CCCSD Zone 1 Project: Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c]: Quantity (AF/yr)	CVP Raw Water Allocation [c]: Escalated Capital Cost	CVP Raw Water Allocation [c]: Escalated O&M Cost	CVP Raw Water Allocation [c]: Total Present Worth Cost
1997	176,500	[illegible]		$1,103,000	$1,103,000	125	[illegible]	[illegible]		[illegible]	[illegible]
1998	178,633	2,447		$1,530,000	$1,436,620	249	175,937	175,937		$11,082,712	$10,406,302
1999	181,767	3,058		$1,989,000	$1,753,620	374	178,335	178,335		$11,683,075	$10,300,491
2000	184,900	3,670		$2,482,000	$2,054,721	498	180,732	180,732		$12,313,734	$10,193,914
2001	188,350	4,235		$2,608,000	$2,027,259	623	183,492	183,492		$13,001,851	$10,106,639
2002	191,800	4,800		$2,740,000	$1,999,873	664	186,336	186,336		$13,731,506	$10,022,363
2003	195,250	5,365		$2,878,000	$1,972,392	706	189,179	189,179		$14,498,653	$9,936,422
2004	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	202,150	6,495		$3,175,000	$1,918,434	789	194,866	194,866		$16,153,160	$9,760,243
2006	205,600	7,060		$3,334,000	$1,891,556	830	197,710	195,000		$16,810,838	$9,537,683
2007	209,050	7,625		$3,501,000	$1,865,074	830	200,595	195,000		$17,483,272	$9,313,794
2008	212,500	8,190		$3,676,000	$1,838,780	830	203,480	195,000		$18,182,603	$9,095,160
2009	215,950	8,755		$3,860,000	$1,812,976	830	206,365	195,000		$18,909,907	$8,881,659
2010	219,400	9,320		$4,052,000	$1,787,000	830	209,250	195,000		$19,666,303	$8,673,169
2011	221,190	[illegible]		[illegible]	[illegible]	830	210,475	139,500		[illegible]	[illegible]
2012	222,980	10,450		$4,465,000	$1,736,110	830	211,700	166,000		$18,107,683	$7,040,747
2013	224,770	11,015		$4,686,000	$1,710,837	830	212,925	166,000		$18,831,990	$6,875,472
2014	226,560	11,580		$4,917,000	$1,685,609	830	214,150	166,000		$19,585,270	$6,714,076
2015	228,350	12,145		$5,160,000	$1,660,951	830	215,375	166,000		$20,368,681	$6,556,468
2016	230,140	12,710		$5,414,000	$1,636,348	830	216,600	166,000		$21,183,428	$6,402,581
2017	231,930	13,275		$5,681,000	$1,612,251	830	217,825	166,000		$22,030,765	$6,252,266
2018	233,720	13,840		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2019	235,510	14,405		$6,252,000	$1,564,327	830	220,275	166,000		$23,828,476	$5,962,177
2020	237,300	14,970		$6,558,000	$1,540,744	830	221,500	166,000		$24,781,615	$5,822,220
2021	238,100	15,267		$6,770,000	$1,493,475	830	222,003	166,000		$25,772,879	$5,685,548
2022	238,900	15,564		$6,989,000	$1,447,688	830	222,506	166,000		$26,803,794	$5,552,085
2023	239,700	15,861		$7,215,000	$1,403,287	830	223,009	166,000		$27,875,946	$5,421,754
2024	240,500	16,158		$7,447,000	$1,360,010	830	223,512	166,000		$28,990,984	$5,294,483
2025	241,300	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2026	242,100	16,752		$7,934,000	$1,277,478	830	224,518	166,000		$31,356,648	$5,048,833
2027	242,900	17,049		$8,188,000	$1,237,912	830	225,021	166,000		$32,610,914	$4,930,316
2028	243,700	17,346		$8,450,000	$1,199,551	830	225,524	166,000		$33,915,351	$4,814,581
2029	244,500	17,643		$8,719,000	$1,162,196	830	226,027	166,000		$35,271,965	$4,701,562
2030	245,300	17,940		$8,997,000	$1,126,058	830	226,530	166,000		$36,682,843	$4,591,197
2031	245,530	18,237		$9,283,000	$1,090,942	830	226,463	166,000		$38,150,157	$4,483,422
2032	245,760	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2033	245,990	18,831		$9,881,000	$1,023,800	830	226,329	166,000		$41,263,210	$4,275,404
2034	246,220	19,128		$10,193,000	$991,669	830	226,262	166,000		$42,913,738	$4,175,042
2035	246,450	19,425		$10,514,000	$960,468	830	226,195	166,000		$44,630,288	$4,077,036
2036	246,680	19,722		$10,845,000	$930,240	830	226,128	166,000		$46,415,499	$3,981,331
2037	246,910	20,019		$11,185,000	$900,848	830	226,061	166,000		$48,272,119	$3,887,873
2038	247,140	20,316		$11,535,000	$872,336	830	225,994	166,000		$50,203,004	$3,796,608
2039	247,370	20,613		[illegible]	[illegible]	830	225,927	139,500		[illegible]	[illegible]
2040	247,600	20,910		$12,266,000	$817,843	830	225,860	166,000		$54,299,569	$3,620,456
Subtotals:	9,934,650	564,830			$64,419,180	33,825	9,335,995	7,385,549			$283,791,123
		5.7%		Unit Cost ($/AF avoided):	$114	*0.3%*	*94.0%*	*74.3%*		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100412

Service Area "E" Resource Alternative 4 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation Capital Cost (1995): $24,660,000 O&M Cost (1995): $337 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation Capital Cost (1995): $72,940,000 O&M Cost (1995): $320 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Central County Industrial (Cooling Towers) Capital Cost (1995): $48,460,000 O&M Cost (1995): $935 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	243,385	0		$0	$0	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	48,066	0		$0	$0	0		$0	$0	0		$0	$0
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	2,710	0		$0	$0	0		$0	$0	0		$0	$0
2007	5,595	0		$0	$0	0		$0	$0	0		$0	$0
2008	8,480	0		$0	$0	0		$0	$0	0	$40,344,731	$0	$20,180,928
2009	11,365	0		$0	$0	0		$0	$0	0	$41,958,520	$0	$19,707,198
2010	14,250	0		$0	$0	0		$0	$0	0		$0	$0
2011	20,975	0		$0	$0	0		$0	$0	13,300		$24,223,117	$9,444,999
2012	45,700	0		$0	$0	0		$0	$0	13,300		$24,223,117	$9,418,590
2013	46,925	0		$0	$0	0		$0	$0	13,300		$25,192,041	$9,197,497
2014	48,150	0		$0	$0	0		$0	$0	13,300		$26,199,723	$8,981,593
2015	49,375	0		$0	$0	0		$0	$0	13,300		$27,247,712	$8,770,757
2016	50,600	0	$28,097,210	$0	$8,492,209	0		$0	$0	13,300		$28,337,620	$8,564,871
2017	51,825	0	$29,221,099	$0	$8,292,861	0	$86,430,938	$0	$24,528,844	13,300		$29,471,125	$8,363,818
2018	79,550	0	$0	$0	$0	0	$89,888,176	$0	$23,065,249	13,300		$30,649,970	$8,167,384
2019	54,275	1,687	$1,457,287	$364,631		0		$0	$0	13,300		$31,875,969	$7,975,759
2020	55,500	1,687	$1,515,579	$356,072		6,240		$5,323,142	$1,250,825	13,300		$33,151,008	$7,788,535
2021	56,003	1,687	$1,576,202	$347,713		6,240		$5,536,068	$1,221,268	13,300		$34,477,048	$7,605,705
2022	56,506	1,687	$1,639,250	$339,551		6,240		$5,757,510	$1,192,599	13,300		$35,856,130	$7,427,168
2023	57,009	1,687	$1,704,820	$331,580		6,240		$5,987,811	$1,164,604	13,300		$37,290,375	$7,252,821
2024	57,512	1,687	$1,773,013	$323,797		6,240		$6,227,323	$1,137,266	13,300		$38,781,990	$7,082,567
2025	84,015	1,687	$1,843,933	$316,197		6,240		$6,476,416	$1,110,569	13,300		$40,333,270	$6,916,309
2026	58,518	1,687	$1,917,690	$308,773		6,240		$6,735,473	$1,084,500	13,300		$41,946,601	$6,753,955
2027	59,021	1,687	$1,994,398	$301,525		6,240		$7,004,892	$1,059,042	13,300		$43,624,465	$6,595,411
2028	59,524	1,687	$2,074,174	$294,447		6,240		$7,285,087	$1,034,182	13,300		$45,369,443	$6,440,589
2029	60,027	1,687	$2,157,141	$287,535		6,240		$7,576,491	$1,009,905	13,300		$47,184,221	$6,289,402
2030	60,530	1,687	$2,243,427	$280,786		6,240		$7,879,551	$986,199	13,300		$49,071,590	$6,141,763
2031	60,463	1,687	$2,333,164	$274,194		6,240		$8,194,733	$963,048	13,300		$51,034,453	$5,997,590
2032	84,856	1,687	$2,426,490	$267,753		6,240		$8,522,522	$940,444	13,300		$53,075,811	$5,856,802
2033	60,329	1,687	$2,523,550	$261,472		6,240		$8,863,423	$918,386	13,300		$55,198,865	$5,719,318
2034	60,262	1,687	$2,624,492	$255,335		6,240		$9,217,960	$896,808	13,300		$57,406,819	$5,585,062
2035	60,195	1,687	$2,729,471	$249,341		6,240		$9,586,678	$875,756	13,300		$59,703,092	$5,453,957
2036	60,128	1,687	$2,838,650	$243,488		6,240		$9,970,145	$855,198	13,300		$62,091,216	$5,325,930
2037	60,061	1,687	$2,952,196	$237,772		6,240		$10,368,951	$835,123	13,300		$64,574,864	$5,200,908
2038	59,994	1,687	$3,070,284	$232,191		6,240		$10,783,709	$815,519	13,300		$67,157,859	$5,078,821
2039	86,427	1,687	$3,193,096	$226,740		6,240		$11,215,057	$796,374	13,300		$69,844,000	$4,959,600
2040	59,860	1,687	$3,320,819	$221,418		6,240		$11,663,660	$777,681	13,300		$72,637,940	$4,843,177
Subtotals:	1,950,446	37,114			$23,107,364	131,040			$59,406,968	399,000			$249,288,885
	19.6%	0.4%		Unit Cost ($/AF):	$623	1.3%		Unit Cost ($/AF):	$530	4.0%		Unit Cost ($/AF):	$625

C—100413

Service Area "E" Resource Alternative 4 Present Worth

	Central County Industrial (Boiler Feed)				ECCID			
	Capital Cost (1995): $119,220,000				Capital Cost (1995): -			
	O&M Cost (1995): $1,460				O&M Cost (1995): $63			
Year	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
[redacted]								
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
[redacted]								
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	2,710		$170,730	$98,864
2007	0		$0	$0	5,595		$352,485	$187,778
2008	0	$99,255,032	$0	$49,648,582	8,480		$534,240	$267,233
2009	0	$103,225,233	$0	$48,483,122	11,365		$715,995	$336,291
2010	0		$0	$0	14,250		$897,750	$395,923
[redacted]								
2012	11,300		$32,136,462	$12,495,509	21,000		$1,323,000	$514,417
2013	12,200		$36,083,844	$13,174,043	21,000		$1,323,000	$483,021
2014	12,200		$37,527,198	$12,864,793	21,000		$1,323,000	$453,541
2015	12,200		$39,028,285	$12,582,803	21,000		$1,323,000	$425,860
2016	12,200		$40,589,417	$12,267,901	21,000		$1,323,000	$399,869
2017	12,200		$42,212,994	$11,979,922	21,000		$1,323,000	$375,463
[redacted]								
2019	12,200		$45,657,574	$11,424,086	21,000		$1,323,000	$331,031
2020	12,200		$47,483,877	$11,155,915	21,000		$1,323,000	$310,827
2021	12,200		$49,383,232	$10,894,039	21,000		$1,323,000	$291,856
2022	12,200		$51,358,561	$10,638,310	21,000		$1,323,000	$274,044
2023	12,200		$53,412,904	$10,388,585	21,000		$1,323,000	$257,318
2024	12,200		$55,549,420	$10,144,721	21,000		$1,323,000	$241,613
[redacted]								
2026	12,200		$60,082,252	$9,674,033	21,000		$1,323,000	$213,020
2027	12,200		$62,485,542	$9,446,943	21,000		$1,323,000	$200,019
2028	12,200		$64,984,964	$9,225,184	21,000		$1,323,000	$187,811
2029	12,200		$67,584,363	$9,008,630	21,000		$1,323,000	$176,349
2030	12,200		$70,287,737	$8,797,160	21,000		$1,323,000	$165,586
2031	12,200		$73,099,247	$8,590,654	21,000		$1,323,000	$155,480
[redacted]								
2033	12,200		$79,064,145	$8,192,071	21,000		$1,323,000	$137,060
2034	12,200		$82,226,711	$7,999,769	21,000		$1,323,000	$128,714
2035	12,200		$85,515,779	$7,811,981	21,000		$1,323,000	$120,858
2036	12,200		$88,936,411	$7,628,601	21,000		$1,323,000	$113,482
2037	12,200		$92,493,867	$7,449,526	21,000		$1,323,000	$106,585
2038	12,200		$96,193,622	$7,274,654	21,000		$1,323,000	$100,052
[redacted]								
2040	12,200		$104,043,021	$6,937,130	21,000		$1,323,000	$88,212
Subtotals:	363,000			$394,693,863	695,400			$10,015,495
	3.7%		*Unit Cost ($/AF):*	$1,087	*7.0%*		Unit Cost ($/AF purchased):	$14

C-100414

C-100414

Service Area "E" Resource Alternative 4 Present Worth

Year	Surface Water Transfer — Capital Cost (1995): - ; O&M Cost (1995): $175				Spot Surface Water Transfer — Capital Cost (1995): - ; O&M Cost (1995): $300			
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	35,385		$12,040,365	$12,040,365
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0
2008	0		$0	$0	0		$0	$0
2009	0		$0	$0	0		$0	$0
2010	0		$0	$0	0		$0	$0
2011	75		$35,950	$14,867	28,500		[illegible]	[illegible]
2012	100		$51,048	$19,849	0		$0	$0
2013	425		$231,057	$84,358	0		$0	$0
2014	1,650		$955,354	$327,507	0		$0	$0
2015	2,875		$1,772,834	$570,657	0		$0	$0
2016	4,100		$2,692,549	$813,806	0		$0	$0
2017	5,325		$3,724,338	$1,058,956	0		$0	$0
2018	6,560		$4,878,852	$1,300,105	28,500		$33,838,267	[illegible]
2019	6,088		$4,829,512	$1,208,403	0		$0	$0
2020	1,073		$906,521	$212,979	0		$0	$0
2021	1,576		$1,418,026	$312,819	0		$0	$0
2022	2,079		$1,992,195	$412,659	0		$0	$0
2023	2,582		$2,635,016	$512,500	0		$0	$0
2024	3,085		$3,352,987	$612,340	0		$0	$0
2025	[illegible]		[illegible]	$712,180	28,500		$52,584,211	[illegible]
2026	4,091		$5,043,190	$812,020	0		$0	$0
2027	4,594		$6,031,377	$911,860	0		$0	$0
2028	5,097		$7,126,721	$1,011,700	0		$0	$0
2029	5,600		$8,338,976	$1,111,541	0		$0	$0
2030	6,103		$9,678,715	$1,211,381	0		$0	$0
2031	6,036		$10,194,670	$1,198,082	0		$0	$0
2032	[illegible]		[illegible]	[illegible]	28,500		[illegible]	[illegible]
2033	5,902		$11,306,348	$1,171,484	0		$0	$0
2034	5,835		$11,904,567	$1,158,186	0		$0	$0
2035	5,768		$12,532,786	$1,144,887	0		$0	$0
2036	5,701		$13,192,376	$1,131,588	0		$0	$0
2037	5,634		$13,884,761	$1,118,289	0		$0	$0
2038	5,567		$14,611,419	$1,104,990	0		$0	$0
2039	5,500		$15,373,880	$1,091,692	28,500		$126,984,254	$9,017,089
2040	5,433		$16,173,727	$1,078,393	0		$0	$0
Subtotals:	124,001			$24,612,881	200,891			$68,356,593
	1.2%		Unit Cost ($/AF purchased):	$198	2.0%		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	9,934,650		$1,167,692,362
		Unit Cost ($/AF):	$120
Totals (without CVP allocation):	2,549,101		$903,901,239
		Unit Cost ($/AF):	$355

C-100415

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Service Area "E" Resource Alternative 5 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 3 — Capital Cost (1995): - ; O&M Cost (1995): - — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project — Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] — Capital Cost (1995): - ; O&M Cost (1995): $56 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	176,500	2,710		$1,628,000	$1,628,000	125	[illegible]	[illegible]		[illegible]	[illegible]
1998	178,633	3,613		$2,257,000	$2,119,249	249	174,771	174,771		$11,009,263	$10,337,336
1999	181,767	4,517		$2,934,000	$2,588,788	374	176,876	176,876		$11,587,493	$10,216,221
2000	184,900	5,420		$3,662,000	$3,031,583	498	178,982	178,982		$12,194,502	$10,095,208
2001	188,350	6,728		$3,874,000	$3,011,350	623	180,999	180,999		$12,825,203	$9,969,326
2002	191,800	8,035		$4,098,000	$2,991,052	664	183,101	183,101		$13,493,112	$9,848,364
2003	195,250	9,343		$4,333,000	$2,969,553	706	185,201	185,201		$14,193,780	$9,727,482
2004	198,700	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	202,150	11,958		$4,840,000	$2,924,479	789	189,403	189,403		$15,700,312	$9,486,618
2006	205,600	13,265		$5,114,000	$2,901,444	830	191,505	191,505		$16,509,536	$9,366,739
2007	209,050	14,573		$5,402,000	$2,877,786	830	193,647	193,647		$17,361,965	$9,249,171
2008	212,500	15,880		$5,705,000	$2,853,711	830	195,790	195,000		$18,182,603	$9,095,160
2009	215,950	17,188		$6,023,000	$2,828,900	830	197,932	195,000		$18,909,907	$8,881,659
2010	219,400	18,495		$6,357,000	$2,803,544	830	200,075	195,000		$19,666,303	$8,673,169
2011	221,190	[illegible]		[illegible]	[illegible]	830	[illegible]	[illegible]		[illegible]	[illegible]
2012	222,980	21,110		$7,079,000	$2,752,503	830	201,040	166,000		$18,107,683	$7,040,747
2013	224,770	22,418		$7,467,000	$2,726,167	830	201,522	166,000		$18,831,990	$6,875,472
2014	226,560	23,725		$7,875,000	$2,699,649	830	202,005	166,000		$19,585,270	$6,714,076
2015	228,350	25,033		$8,304,000	$2,672,972	830	202,487	166,000		$20,368,681	$6,556,468
2016	230,140	26,340		$8,755,000	$2,646,145	830	202,970	166,000		$21,183,428	$6,402,561
2017	231,930	27,648		$9,228,000	$2,618,879	830	203,452	166,000		$22,030,765	$6,252,266
2018	233,720	[illegible]		$9,725,000	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2019	235,510	30,263		$10,248,000	$2,564,175	830	204,417	166,000		$23,828,476	$5,962,177
2020	237,300	31,570		$10,797,000	$2,536,659	830	204,900	166,000		$24,781,615	$5,822,220
2021	238,100	31,683		$11,179,000	$2,466,110	830	205,587	166,000		$25,772,879	$5,685,548
2022	238,900	31,795		$11,574,000	$2,397,415	830	206,275	166,000		$26,803,794	$5,552,065
2023	239,700	31,908		$11,983,000	$2,330,643	830	206,962	166,000		$27,875,946	$5,421,754
2024	240,500	32,020		$12,406,000	$2,265,648	830	207,650	166,000		$28,990,984	$5,294,483
2025	241,300	32,133		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2026	242,100	32,245		$13,297,000	$2,140,992	830	209,025	166,000		$31,356,648	$5,048,833
2027	242,900	32,358		$13,766,000	$2,081,227	830	209,712	166,000		$32,610,914	$4,930,316
2028	243,700	32,470		$14,251,000	$2,023,054	830	210,400	166,000		$33,915,351	$4,814,581
2029	244,500	32,583		$14,752,000	$1,966,362	830	211,087	166,000		$35,271,965	$4,701,562
2030	245,300	32,695		$15,271,000	$1,911,307	830	211,775	166,000		$36,682,843	$4,591,197
2031	245,530	32,808		$15,808,000	$1,857,763	830	211,892	166,000		$38,150,157	$4,483,422
2032	245,760	32,920		[illegible]	[illegible]	830	212,010	139,500		[illegible]	[illegible]
2033	245,990	33,033		$16,939,000	$1,755,100	830	212,127	166,000		$41,263,210	$4,275,404
2034	246,220	33,145		$17,533,000	$1,705,771	830	212,245	166,000		$42,913,738	$4,175,042
2035	246,450	33,258		$18,148,000	$1,657,844	830	212,362	166,000		$44,630,288	$4,077,036
2036	246,680	33,370		$18,784,000	$1,611,215	830	212,480	166,000		$46,415,499	$3,981,331
2037	246,910	33,483		$19,442,000	$1,565,873	830	212,597	166,000		$48,272,119	$3,887,873
2038	247,140	33,595		$20,122,000	$1,521,729	830	212,715	166,000		$50,203,004	$3,796,608
2039	247,370	33,708		$20,826,000	[illegible]	830	212,832	139,500		[illegible]	[illegible]
2040	247,600	33,820		$21,554,000	$1,437,126	830	212,950	166,000		$54,299,569	$3,620,456
Subtotals:	9,934,650	1,054,270			$103,244,020	33,825	8,846,555	7,356,961			$282,288,416
		10.6%		Unit Cost ($/AF avoided):	$98	*0.3%*	*89.0%*	*74.1%*		Unit Cost ($/AF purchased):	$38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

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C-100417

Service Area "E" Resource Alternative 5 Present Worth

Year	Net Deficit (AF/yr)	ECCID Quantity (AF/yr)	ECCID Escalated Capital Cost	ECCID Escalated O&M Cost	ECCID Total Present Worth Cost	Surface Water Transfer Quantity (AF/yr)	Surface Water Transfer Escalated Capital Cost	Surface Water Transfer Escalated O&M Cost	Surface Water Transfer Total Present Worth Cost	Spot Surface Water Transfer Quantity (AF/yr)	Spot Surface Water Transfer Escalated Capital Cost	Spot Surface Water Transfer Escalated O&M Cost	Spot Surface Water Transfer Total Present Worth Cost
		Capital Cost (1995):	-			Capital Cost (1995):	-			Capital Cost (1995):	-		
		O&M Cost (1995):	$63			O&M Cost (1995):	$175			O&M Cost (1995):	$300		
1997	[illegible]	8,000		$504,000	$504,000	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	[illegible]	16,000		[illegible]	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0	0		$0	$0
2008	790	790		$49,770	$24,896	0		$0	$0	0		$0	$0
2009	2,932	2,932		$184,716	$86,758	0		$0	$0	0		$0	$0
2010	5,075	5,075		$319,725	$141,004	0		$0	$0	0		$0	$0
2011	61,057	21,000		$1,323,000	[illegible]	13,557		[illegible]	[illegible]	28,500		[illegible]	$9,017,089
2012	35,040	21,000		$1,323,000	$514,417	14,040		$7,167,183	$2,786,791	0		$0	$0
2013	35,522	21,000		$1,323,000	$483,021	14,522		$7,895,096	$2,882,463	0		$0	$0
2014	36,005	21,000		$1,323,000	$453,541	15,005		$8,687,936	$2,978,333	0		$0	$0
2015	36,487	21,000		$1,323,000	$425,860	15,487		$9,549,871	$3,074,005	0		$0	$0
2016	36,970	21,000		$1,323,000	$399,869	15,970		$10,487,808	$3,169,875	0		$0	$0
2017	37,452	21,000		$1,323,000	$375,463	16,452		$11,506,629	$3,265,547	0		$0	$0
2018	64,435	21,000		$1,323,000	[illegible]	16,935		[illegible]	[illegible]	28,500		[illegible]	$9,017,089
2019	38,417	21,000		$1,323,000	$331,031	17,417		$13,816,626	$3,457,089	0		$0	$0
2020	38,900	21,000		$1,323,000	$310,827	17,900		$15,122,767	$3,552,960	0		$0	$0
2021	39,587	21,000		$1,323,000	$291,856	18,587		$16,723,884	$3,689,322	0		$0	$0
2022	40,275	21,000		$1,323,000	$274,044	19,275		$18,470,211	$3,825,883	0		$0	$0
2023	40,962	21,000		$1,323,000	$257,318	19,962		$20,371,880	$3,962,245	0		$0	$0
2024	41,650	21,000		$1,323,000	$241,613	20,650		$22,443,818	$4,098,806	0		$0	$0
2025	[illegible]	21,000		$1,323,000	[illegible]	[illegible]		[illegible]	[illegible]	28,500		[illegible]	$9,017,089
2026	43,025	21,000		$1,323,000	$213,020	22,025		$27,151,374	$4,371,728	0		$0	$0
2027	43,712	21,000		$1,323,000	$200,019	22,712		$29,818,162	$4,508,091	0		$0	$0
2028	44,400	21,000		$1,323,000	$187,811	23,400		$32,718,318	$4,644,651	0		$0	$0
2029	45,087	21,000		$1,323,000	$176,349	24,087		$35,868,022	$4,781,014	0		$0	$0
2030	45,775	21,000		$1,323,000	$165,586	24,775		$39,290,539	$4,917,574	0		$0	$0
2031	45,892	21,000		$1,323,000	$155,480	24,892		$42,042,034	$4,940,798	0		$0	$0
2032	72,510	21,000		$1,323,000	[illegible]	25,010		[illegible]	[illegible]	28,500		[illegible]	$9,017,089
2033	46,127	21,000		$1,323,000	$137,060	25,127		$48,135,311	$4,987,443	0		$0	$0
2034	46,245	21,000		$1,323,000	$128,714	25,245		$51,504,850	$5,010,864	0		$0	$0
2035	46,362	21,000		$1,323,000	$120,858	25,362		$55,106,884	$5,034,088	0		$0	$0
2036	46,480	21,000		$1,323,000	$113,482	25,480		$58,961,889	$5,057,509	0		$0	$0
2037	46,597	21,000		$1,323,000	$106,555	25,597		$63,082,754	$5,080,733	0		$0	$0
2038	46,715	21,000		$1,323,000	$100,052	25,715		$67,492,841	$5,104,154	0		$0	$0
2039	73,332	21,000		$1,323,000	[illegible]	[illegible]		[illegible]	[illegible]	28,500		[illegible]	$9,017,089
2040	46,950	21,000		$1,323,000	$88,212	25,950		$77,251,649	$5,150,799	0		$0	$0
Subtotals:	1,489,594	661,797			$8,984,054	628,305			$124,711,967	199,492			$87,880,844
	15.0%	6.7%		Unit Cost ($/AF purchased):	$14	6.3%		Unit Cost ($/AF purchased):	$198	2.0%		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	9,934,650		$587,109,001
		Unit Cost ($/AF):	$59
Totals (without CVP allocation):	2,577,689		$304,820,585
		Unit Cost ($/AF):	$118

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Service Area "E" Resource Alternative 6 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 3 (Capital Cost (1995): - ; O&M Cost (1995): -) Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Raw Water Allocation [c] (Capital Cost (1995): - ; O&M Cost (1995): $56) Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	175,500	2,740		[illegible]	$1,628,000	125	[illegible]	[illegible]		[illegible]	[illegible]
1998	178,633	3,613		$2,257,000	$2,119,249	249	174,771	174,771		$11,009,263	$10,337,336
1999	181,767	4,517		$2,934,000	$2,586,788	374	176,876	176,876		$11,587,493	$10,216,221
2000	184,900	5,420		$3,662,000	$3,031,583	498	178,982	178,982		$12,194,502	$10,095,208
2001	188,350	6,728		$3,874,000	$3,011,350	623	180,999	180,999		$12,825,203	$9,969,326
2002	191,800	8,035		$4,098,000	$2,991,052	664	183,101	183,101		$13,493,112	$9,648,364
2003	195,250	9,343		$4,333,000	$2,969,553	708	185,201	185,201		$14,193,780	$9,727,482
2004	198,700	10,650		[illegible]	[illegible]	747	[illegible]	[illegible]		[illegible]	[illegible]
2005	202,150	11,958		$4,840,000	$2,924,479	789	189,403	189,403		$15,700,312	$9,486,618
2006	205,600	13,265		$5,114,000	$2,901,444	830	191,505	191,505		$16,509,536	$9,366,739
2007	209,050	14,573		$5,402,000	$2,877,786	830	193,647	193,647		$17,361,965	$9,249,171
2008	212,500	15,880		$5,705,000	$2,853,711	830	195,790	195,000		$18,182,603	$9,095,160
2009	215,950	17,188		$6,023,000	$2,828,900	830	197,932	195,000		$18,909,907	$8,881,659
2010	219,400	18,495		$6,357,000	$2,803,544	830	200,075	195,000		$19,666,303	$8,673,169
2011	221,190	19,803		$6,709,000	[illegible]	830	200,557	[illegible]		[illegible]	[illegible]
2012	222,980	21,110		$7,079,000	$2,752,503	830	201,040	166,000		$18,107,683	$7,040,747
2013	224,770	22,418		$7,467,000	$2,726,167	830	201,522	166,000		$18,831,990	$6,875,472
2014	226,560	23,725		$7,875,000	$2,699,649	830	202,005	166,000		$19,585,270	$6,714,076
2015	228,350	25,033		$8,304,000	$2,672,972	830	202,487	166,000		$20,368,681	$6,556,468
2016	230,140	26,340		$8,755,000	$2,646,145	830	202,970	166,000		$21,183,428	$6,402,561
2017	231,930	27,648		$9,228,000	$2,618,879	830	203,452	166,000		$22,030,765	$6,252,266
2018	233,720	[illegible]		[illegible]	[illegible]	830	[illegible]	[illegible]		[illegible]	[illegible]
2019	235,510	30,263		$10,248,000	$2,564,175	830	204,417	166,000		$23,828,476	$5,962,177
2020	237,300	31,570		$10,797,000	$2,536,659	830	204,900	166,000		$24,781,615	$5,822,220
2021	238,100	31,683		$11,179,000	$2,466,110	830	205,587	166,000		$25,772,879	$5,685,548
2022	238,900	31,795		$11,574,000	$2,397,415	830	206,275	166,000		$26,803,794	$5,552,085
2023	239,700	31,908		$11,983,000	$2,330,643	830	206,962	166,000		$27,875,946	$5,421,754
2024	240,500	32,020		$12,406,000	$2,265,648	830	207,650	166,000		$28,990,984	$5,294,483
2025	241,300	32,133		[illegible]	$2,202,476	830	[illegible]	[illegible]		[illegible]	[illegible]
2026	242,100	32,245		$13,297,000	$2,140,992	830	209,025	166,000		$31,356,648	$5,048,833
2027	242,900	32,358		$13,766,000	$2,081,227	830	209,712	166,000		$32,610,914	$4,930,316
2028	243,700	32,470		$14,251,000	$2,023,054	830	210,400	166,000		$33,915,351	$4,814,581
2029	244,500	32,583		$14,752,000	$1,966,362	830	211,087	166,000		$35,271,965	$4,701,562
2030	245,300	32,695		$15,271,000	$1,911,307	830	211,775	166,000		$36,682,843	$4,591,197
2031	245,530	32,808		$15,808,000	$1,857,763	830	211,892	166,000		$38,150,157	$4,483,422
2032	245,760	32,920		[illegible]	[illegible]	830	212,010	139,500		[illegible]	[illegible]
2033	245,990	33,033		$16,939,000	$1,755,100	830	212,127	166,000		$41,263,210	$4,275,404
2034	246,220	33,145		$17,533,000	$1,705,771	830	212,245	166,000		$42,913,738	$4,175,042
2035	246,450	33,258		$18,148,000	$1,657,644	830	212,362	166,000		$44,630,288	$4,077,036
2036	246,680	33,370		$18,784,000	$1,611,215	830	212,480	166,000		$46,415,499	$3,981,331
2037	246,910	33,483		$19,442,000	$1,565,873	830	212,597	166,000		$48,272,119	$3,887,873
2038	247,140	33,595		$20,122,000	$1,521,729	830	212,715	166,000		$50,203,004	$3,796,608
2039	247,370	[illegible]		[illegible]	[illegible]	830	[illegible]	139,500		[illegible]	[illegible]
2040	247,600	33,820		$21,554,000	$1,437,126	830	212,950	166,000		$54,299,569	$3,620,456
Subtotals:	9,934,650	1,054,270 *10.6%*		Unit Cost ($/AF avoided):	$103,244,020 $98	33,825 *0.3%*	8,846,555 *89.0%*	7,356,961 *74.1%*		Unit Cost ($/AF purchased):	$282,288,416 $38

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

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Service Area "E" Resource Alternative 6 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation Capital Cost (1995): $24,660,000 O&M Cost (1995): $337 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation Capital Cost (1995): $72,940,000 O&M Cost (1995): $320 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Central County Industrial (Cooling Towers) Capital Cost (1995): $48,460,000 O&M Cost (1995): $935 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	[illegible]	[illegible]		$0	$0	[illegible]		$0	$0	[illegible]		$0	$0
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	0	0		$0	$0	0		$0	$0	0		$0	$0
2004	[illegible]	[illegible]		$0	$0	[illegible]		$0	$0	[illegible]		$0	$0
2005	0	0		$0	$0	0		$0	$0	0		$0	$0
2006	0	0		$0	$0	0		$0	$0	0		$0	$0
2007	0	0		$0	$0	0		$0	$0	0		$0	$0
2008	790	0		$0	$0	0		$0	$0	0	$40,344,731	$0	$20,180,928
2009	2,932	0		$0	$0	0		$0	$0	0	$41,958,520	$0	$19,707,198
2010	5,075	0		$0	$0	0		$0	$0	0		$0	$0
2011	[illegible]	[illegible]		$0	$0	[illegible]		$0	$0	[illegible]		[illegible]	[illegible]
2012	35,040	0		$0	$0	0		$0	$0	13,300		$24,223,117	$9,418,590
2013	36,522	0		$0	$0	0		$0	$0	13,300		$25,192,041	$9,197,497
2014	36,005	0		$0	$0	0		$0	$0	13,300		$26,199,723	$8,981,593
2015	36,487	0		$0	$0	0		$0	$0	13,300		$27,247,712	$8,770,757
2016	36,970	0		$0	$0	0		$0	$0	13,300		$28,337,620	$8,564,871
2017	37,452	0	$29,221,099	$0	$8,292,861	0	$86,430,938	$0	$24,528,844	13,300		$29,471,125	$8,363,818
2018	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	38,417	0		$0	$0	0		$0	$0	13,300		$31,875,969	$7,975,759
2020	38,900	1,687		$1,515,579	$356,072	6,280		$5,357,265	$1,258,642	13,300		$33,151,008	$7,788,535
2021	39,587	1,687		$1,576,202	$347,713	6,280		$5,571,555	$1,229,096	13,300		$34,477,048	$7,605,705
2022	40,275	1,687		$1,639,250	$339,551	6,280		$5,794,417	$1,200,244	13,300		$35,856,130	$7,427,168
2023	40,962	1,687		$1,704,820	$331,580	6,280		$6,026,194	$1,172,069	13,300		$37,290,375	$7,252,821
2024	41,650	1,687		$1,773,013	$323,797	6,280		$6,267,242	$1,144,556	13,300		$38,781,990	$7,082,567
2025	68,837	1,687		$1,843,933	$316,196	6,280		$6,517,932	$1,117,689	13,300		$40,333,270	$6,916,307
2026	43,025	1,687		$1,917,690	$308,773	6,280		$6,778,649	$1,091,452	13,300		$41,946,601	$6,753,955
2027	43,712	1,687		$1,994,398	$301,525	6,280		$7,049,795	$1,065,831	13,300		$43,624,465	$6,595,411
2028	44,400	1,687		$2,074,174	$294,447	6,280		$7,331,787	$1,040,811	13,300		$45,369,443	$6,440,589
2029	45,087	1,687		$2,157,141	$287,535	6,280		$7,625,058	$1,016,379	13,300		$47,184,221	$6,289,402
2030	45,775	1,687		$2,243,427	$280,786	6,280		$7,930,060	$992,520	13,300		$49,071,590	$6,141,763
2031	45,892	1,687		$2,333,164	$274,194	6,280		$8,247,263	$969,222	13,300		$51,034,453	$5,997,590
2032	72,510	1,687		$2,426,490	$267,754	6,280		$8,577,154	$946,470	13,300		$53,075,831	$5,856,802
2033	46,127	1,687		$2,523,550	$261,472	6,280		$8,920,240	$924,253	13,300		$55,198,865	$5,719,318
2034	46,245	1,687		$2,624,492	$255,335	6,280		$9,277,049	$902,558	13,300		$57,406,819	$5,585,062
2035	46,362	1,687		$2,729,471	$249,341	6,280		$9,648,131	$881,370	13,300		$59,703,092	$5,453,957
2036	46,480	1,687		$2,838,650	$243,488	6,280		$10,034,056	$860,680	13,300		$62,091,216	$5,325,930
2037	46,597	1,687		$2,952,196	$237,772	6,280		$10,436,419	$840,476	13,300		$64,574,864	$5,200,908
2038	46,715	1,687		$3,070,284	$232,191	6,280		$10,852,835	$820,747	13,300		$67,157,859	$5,078,821
2039	72,832	1,687		$3,193,095	$226,740	6,280		$11,286,948	$801,483	13,300		$69,844,173	$4,959,600
2040	46,950	1,687		$3,320,819	$221,416	6,280		$11,738,427	$782,667	13,300		$72,637,940	$4,843,177
Subtotals:	1,489,594	35,427			$22,348,738	131,880			$69,541,103	399,000			$249,288,885
	15.0%	*0.4%*		Unit Cost ($/AF):	$631	*1.3%*		Unit Cost ($/AF):	$527	*4.0%*		Unit Cost ($/AF):	$625

Service Area "E" Resource Alternative 6 Present Worth

Year	ECCID				Surface Water Transfer				Spot Surface Water Transfer			
	Capital Cost (1995): -				Capital Cost (1995): -				Capital Cost (1995): -			
	O&M Cost (1995): $63				O&M Cost (1995): $175				O&M Cost (1995): $300			
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	8,000		$504,000	$504,000	[illegible]		$0	$0	[illegible]		[illegible]	[illegible]
1998	0		$0	$0	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0	0		$0	$0
2004	15,000		[illegible]	[illegible]	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0	0		$0	$0
2007	0		$0	$0	0		$0	$0	0		$0	$0
2008	790		$49,770	$24,896	0		$0	$0	0		$0	$0
2009	2,932		$184,716	$86,758	0		$0	$0	0		$0	$0
2010	5,075		$319,725	$141,004	0		$0	$0	0		$0	$0
2011	21,000		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2012	21,000		$1,323,000	$514,417	740		$377,758	$146,882	0		$0	$0
2013	21,000		$1,323,000	$483,021	1,222		$664,358	$242,554	0		$0	$0
2014	21,000		$1,323,000	$453,541	1,705		$987,200	$338,424	0		$0	$0
2015	21,000		$1,323,000	$425,860	2,187		$1,348,587	$434,096	0		$0	$0
2016	21,000		$1,323,000	$399,869	2,670		$1,753,441	$529,987	0		$0	$0
2017	21,000		$1,323,000	$375,463	3,152		$2,204,528	$625,639	0		$0	$0
2018	21,000		$1,323,000	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2019	21,000		$1,323,000	$331,031	4,117		$3,265,950	$817,181	0		$0	$0
2020	17,633		$1,110,879	$260,991	0		$0	$0	0		$0	$0
2021	18,320		$1,154,160	$254,610	0		$0	$0	0		$0	$0
2022	19,008		$1,197,504	$248,049	0		$0	$0	0		$0	$0
2023	19,695		$1,240,785	$241,327	0		$0	$0	0		$0	$0
2024	20,383		$1,284,129	$234,514	0		$0	$0	0		$0	$0
2025	21,000		$1,323,000	[illegible]	70		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	21,000		$1,323,000	$213,020	758		$934,426	$150,455	0		$0	$0
2027	21,000		$1,323,000	$200,019	1,445		$1,897,114	$286,817	0		$0	$0
2028	21,000		$1,323,000	$187,811	2,133		$2,982,400	$423,378	0		$0	$0
2029	21,000		$1,323,000	$176,349	2,820		$4,199,270	$559,740	0		$0	$0
2030	21,000		$1,323,000	$165,586	3,508		$5,583,318	$896,301	0		$0	$0
2031	21,000		$1,323,000	$155,480	3,625		$6,122,544	$719,524	0		$0	$0
2032	21,000		$1,323,000	[illegible]	3,743		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2033	21,000		$1,323,000	$137,080	3,860		$7,394,528	$766,169	0		$0	$0
2034	21,000		$1,323,000	$128,714	3,978		$8,115,916	$789,591	0		$0	$0
2035	21,000		$1,323,000	$120,858	4,095		$8,897,669	$812,814	0		$0	$0
2036	21,000		$1,323,000	$113,482	4,213		$9,749,075	$836,236	0		$0	$0
2037	21,000		$1,323,000	$106,555	4,330		$10,671,107	$859,459	0		$0	$0
2038	21,000		$1,323,000	$100,052	4,448		$11,674,437	$882,881	0		$0	$0
2039	21,000		$1,323,000	[illegible]	[illegible]		$12,760,320	$906,104	26,500		[illegible]	[illegible]
2040	21,000		$1,323,000	$88,212	4,683		$13,941,020	$929,526	0		$0	$0
Subtotals:	651,836			$6,847,887	71,959			$14,283,097	199,492			$67,880,644
	6.6%		Unit Cost ($/AF purchased):	$14	0.7%		Unit Cost ($/AF purchased):	$198	2.0%		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	9,934,650		$817,722,790
		Unit Cost ($/AF):	$82
Totals (without CVP allocation):	2,577,689		$535,434,374
		Unit Cost ($/AF):	$208

Service Area "F" Resource Alternative 1 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 1: Quantity (AF/yr)	Conservation Program 1: Escalated Capital Cost	Conservation Program 1: Escalated O&M Cost	Conservation Program 1: Total Present Worth Cost	CCCSD Zone 1 Project: Quantity (AF/yr)	Historical Demand (AF/yr) [b]	Normal Year: CVP Contract (AF/yr) [c]	Normal Year: Net Deficit (AF/yr)	Drought Year: CVP Contract (AF/yr) [d]	Drought Year: Net Deficit (AF/yr)	CVP Raw Water Allocation [c]: Quantity (AF/yr)	CVP Raw Water Allocation [c]: Escalated Capital Cost	CVP Raw Water Allocation [c]: Escalated O&M Cost	CVP Raw Water Allocation [c]: Total Present Worth Cost
		Capital Cost (1995): -								Cutback: 25%		Capital Cost (1995): -			
		O&M Cost (1995): -										O&M Cost (1995): $56			
1997	183,800	1,015		$592,000	$592,000	125	182,660	195,000	0	136,995	45,665	136,995		$8,297,732	$8,297,732
1998	187,167	1,353		$1,237,000	$1,161,502	249	185,565	195,000	0	139,174	-	185,565		$11,689,161	$10,975,738
1999	190,533	1,692		$1,609,000	$1,418,590	374	188,467	195,000	0	141,351	-	188,467		$12,346,887	$10,885,747
2000	193,900	2,030		$2,007,000	$1,661,493	498	191,372	195,000	0	143,529	-	191,372		$13,038,665	$10,794,047
2001	197,960	2,383		$2,112,000	$1,641,706	623	194,954	195,000	0	146,216	-	194,954		$13,814,024	$10,737,960
2002	202,020	2,736		$2,223,000	$1,622,525	664	198,620	195,000	3,620	161,250	-	195,000		$14,369,975	$10,488,369
2003	206,080	3,089		$2,338,000	$1,602,311	706	202,285	195,000	7,285	161,250	-	195,000		$14,944,774	$10,242,164
2004	210,140	3,442		$2,459,000	[illegible]	747	205,951	195,000	10,951	161,250	44,701	161,250		[illegible]	$8,270,687
2005	214,200	3,795		$2,587,000	$1,583,146	789	209,616	195,000	14,616	161,250	-	195,000		$16,164,268	$9,766,955
2006	218,260	4,148		$2,720,000	$1,543,201	830	213,282	195,000	18,282	161,250	-	195,000		$16,810,838	$9,537,683
2007	222,320	4,501		$2,860,000	$1,523,596	830	216,989	195,000	21,989	161,250	-	195,000		$17,483,272	$9,313,794
2008	226,380	4,854		$3,007,000	$1,504,138	830	220,696	195,000	25,696	161,250	-	195,000		$18,182,603	$9,095,160
2009	230,440	5,207		$3,161,000	$1,484,668	830	224,403	195,000	29,403	161,250	-	195,000		$18,909,907	$8,881,659
2010	234,500	5,560		$3,323,000	$1,465,499	830	228,110	195,000	33,110	161,250	-	195,000		$19,666,303	$8,673,169
2011	238,360	5,913		$3,492,000	$1,446,036	830	231,617	166,000	65,617	139,500	92,117	139,500		$14,831,729	$6,059,003
2012	242,220	6,266		$3,670,000	$1,426,993	830	235,124	166,000	69,124	139,500	-	166,000		$18,107,683	$7,040,747
2013	246,080	6,619		$3,856,000	$1,407,808	830	238,631	166,000	72,631	139,500	-	166,000		$18,831,990	$6,875,472
2014	249,940	6,972		$4,051,000	$1,388,733	830	242,138	166,000	76,138	139,500	-	166,000		$19,585,270	$6,714,076
2015	253,800	7,325		$4,256,000	$1,369,962	830	245,645	166,000	79,645	139,500	-	166,000		$20,368,681	$6,556,468
2016	257,660	7,678		$4,471,000	$1,351,332	830	249,152	166,000	83,152	139,500	-	166,000		$21,183,428	$6,402,561
2017	261,520	8,031		$4,696,000	$1,332,711	830	252,659	166,000	86,659	139,500	-	166,000		$22,030,765	$6,252,266
2018	265,380	8,384		$4,932,000	$1,313,260	830	256,166	166,000	90,166	139,500	116,666	139,500		[illegible]	$5,130,828
2019	269,240	8,737		$5,179,000	$1,295,849	830	259,673	166,000	93,673	139,500	-	166,000		$23,828,476	$5,962,177
2020	273,100	9,090		$5,438,000	$1,277,610	830	263,180	166,000	97,180	139,500	-	166,000		$24,781,615	$5,822,220
2021	274,580	9,272		$5,617,000	$1,239,121	830	264,478	166,000	98,478	139,500	-	166,000		$25,772,879	$5,685,548
2022	276,060	9,454		$5,801,000	$1,201,608	830	265,776	166,000	99,776	139,500	-	166,000		$26,803,794	$5,552,085
2023	277,540	9,636		$5,991,000	$1,165,224	830	267,074	166,000	101,074	139,500	-	166,000		$27,875,946	$5,421,754
2024	279,020	9,818		$6,187,000	$1,129,902	830	268,372	166,000	102,372	139,500	-	166,000		$28,990,984	$5,294,483
2025	280,500	10,000		[illegible]	[illegible]	830	269,670	166,000	103,670	139,500	130,170	139,500		[illegible]	[illegible]
2026	281,980	10,182		$6,598,000	$1,062,365	830	270,968	166,000	104,968	139,500	-	166,000		$31,356,648	$5,048,833
2027	283,460	10,364		$6,813,000	$1,030,031	830	272,266	166,000	106,266	139,500	-	166,000		$32,610,914	$4,930,316
2028	284,940	10,546		$7,034,000	$998,538	830	273,564	166,000	107,564	139,500	-	166,000		$33,915,351	$4,814,581
2029	286,420	10,728		$7,262,000	$967,985	830	274,862	166,000	108,862	139,500	-	166,000		$35,271,965	$4,701,562
2030	287,900	10,910		$7,498,000	$938,444	830	276,160	166,000	110,160	139,500	-	166,000		$36,682,843	$4,591,197
2031	288,810	11,092		$7,740,000	$909,608	830	276,888	166,000	110,888	139,500	-	166,000		$38,150,157	$4,483,422
2032	289,720	11,274		$7,990,000	[illegible]	830	277,616	166,000	111,616	139,500	138,116	139,500		[illegible]	[illegible]
2033	290,630	11,456		$8,247,000	$854,496	830	278,344	166,000	112,344	139,500	-	166,000		$41,263,210	$4,275,404
2034	291,540	11,638		$8,513,000	$828,223	830	279,072	166,000	113,072	139,500	-	166,000		$42,913,738	$4,176,042
2035	292,450	11,820		$8,786,000	$802,613	830	279,800	166,000	113,800	139,500	-	166,000		$44,630,288	$4,077,036
2036	293,360	12,002		$9,067,000	$777,730	830	280,528	166,000	114,528	139,500	-	166,000		$46,415,499	$3,981,331
2037	294,270	12,184		$9,367,000	$753,620	830	281,256	166,000	115,256	139,500	-	166,000		$48,272,119	$3,887,873
2038	295,180	12,366		$9,656,000	$730,236	830	281,984	166,000	115,984	139,500	-	166,000		$50,203,004	$3,796,608
2039	296,090	12,548		[illegible]	$707,639	830	282,712	166,000	116,712	139,500	143,212	139,500		[illegible]	[illegible]
2040	297,000	12,730		$10,280,000	$685,425	830	283,440	166,000	117,440	139,500	-	166,000		$54,299,569	$3,620,456
Subtotals:	11,216,450	340,840			$53,038,021	33,826	10,841,785					7,466,103			$288,253,909
		3.0%		Unit Cost ($/AF avoided):	$156	0.3%	96.7%					66.6%		Unit Cost ($/AF purchased):	$39

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100421

C-100421

C-100422

Service Area "F" Resource Alternative 1 Present Worth

Year	Net Deficit (AF/yr)	ECCID — Capital Cost (1995): - ; O&M Cost (1995): $63 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Surface Water Transfer — Capital Cost (1995): - ; O&M Cost (1995): $175 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer — Capital Cost (1995): - ; O&M Cost (1995): $300 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	[illegible]	[illegible]		$504,000	$504,000	[illegible]		$0	$0	[illegible]		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	3,620	3,620		$228,060	$166,457	0		$0	$0	0		$0	$0
2003	7,285	7,285		$458,955	$314,538	0		$0	$0	0		$0	$0
2004	[illegible]	15,000		[illegible]	[illegible]	0		$0	$0	29,701		[illegible]	[illegible]
2005	14,616	14,616		$920,808	$556,381	0		$0	$0	0		$0	$0
2006	18,282	15,000		$945,000	$536,149	3,282		$1,148,213	$651,442	0		$0	$0
2007	21,989	15,000		$945,000	$503,426	6,989		$2,604,044	$1,387,242	0		$0	$0
2008	25,696	15,000		$945,000	$472,701	10,696		$4,244,283	$2,123,042	0		$0	$0
2009	29,403	15,000		$945,000	$443,850	14,403		$6,086,751	$2,858,842	0		$0	$0
2010	33,110	21,000		$1,323,000	$583,465	12,110		$5,450,374	$2,403,706	0		$0	$0
2011	[illegible]	21,000		$1,323,000	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	$9,017,089
2012	69,124	21,000		$1,323,000	$514,417	48,124		$24,566,489	$9,552,103	0		$0	$0
2013	72,631	21,000		$1,323,000	$483,021	51,631		$28,069,943	$10,248,205	0		$0	$0
2014	76,138	21,000		$1,323,000	$453,541	55,138		$31,925,051	$10,944,307	0		$0	$0
2015	79,645	21,000		$1,323,000	$425,860	58,645		$36,162,729	$11,640,409	0		$0	$0
2016	83,152	21,000		$1,323,000	$399,869	62,152		$40,816,421	$12,336,512	0		$0	$0
2017	86,659	21,000		$1,323,000	$375,463	65,659		$45,922,306	$13,032,614	0		$0	$0
2018	[illegible]	21,000		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2019	93,673	21,000		$1,323,000	$331,031	72,673		$57,650,320	$14,424,818	0		$0	$0
2020	97,180	21,000		$1,323,000	$310,827	76,180		$64,360,471	$15,120,921	0		$0	$0
2021	98,478	21,000		$1,323,000	$291,856	77,478		$69,711,793	$15,378,560	0		$0	$0
2022	99,776	21,000		$1,323,000	$274,044	78,776		$75,486,864	$15,636,199	0		$0	$0
2023	101,074	21,000		$1,323,000	$257,318	80,074		$81,718,162	$15,893,838	0		$0	$0
2024	102,372	21,000		$1,323,000	$241,613	81,372		$88,440,597	$16,151,477	0		$0	$0
2025	130,170	21,000		$1,323,000	$226,867	82,670		$95,691,689	$16,409,117	26,500		$52,684,211	$9,017,089
2026	104,968	21,000		$1,323,000	$213,020	83,968		$103,511,761	$16,666,756	0		$0	$0
2027	106,266	21,000		$1,323,000	$200,019	85,266		$111,944,146	$16,924,395	0		$0	$0
2028	107,564	21,000		$1,323,000	$187,811	86,564		$121,035,403	$17,182,034	0		$0	$0
2029	108,862	21,000		$1,323,000	$176,349	87,862		$130,835,560	$17,439,673	0		$0	$0
2030	110,160	21,000		$1,323,000	$165,586	89,160		$141,398,363	$17,697,313	0		$0	$0
2031	110,888	21,000		$1,323,000	$155,480	89,888		$151,818,832	$17,841,813	0		$0	$0
2032	138,116	21,000		$1,323,000	$145,990	90,616		$162,998,554	$17,986,313	26,500		$81,715,156	$9,017,089
2033	112,344	21,000		$1,323,000	$137,080	91,344		$174,985,946	$18,130,813	0		$0	$0
2034	113,072	21,000		$1,323,000	$128,714	92,072		$187,845,298	$18,275,314	0		$0	$0
2035	113,800	21,000		$1,323,000	$120,858	92,800		$201,637,050	$18,419,814	0		$0	$0
2036	114,528	21,000		$1,323,000	$113,482	93,528		$216,428,084	$18,564,314	0		$0	$0
2037	115,256	21,000		$1,323,000	$106,555	94,256		$232,290,036	$18,708,815	0		$0	$0
2038	115,984	21,000		$1,323,000	$100,052	94,984		$249,299,632	$18,853,315	0		$0	$0
2039	143,212	21,000		$1,323,000	$93,946	95,712		$267,539,051	$18,997,815	26,500		$126,954,254	$9,017,089
2040	117,440	21,000		$1,323,000	$88,212	96,440		$287,096,303	$19,142,315	0		$0	$0
Subtotals:	3,375,682	759,521			$12,308,382	2,416,295			$479,608,884	199,866			$68,007,904
	30.1%	*6.8%*		Unit Cost ($/AF purchased):	$16	*21.5%*		Unit Cost ($/AF purchased):	$198	*1.8%*		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	11,216,450		$901,217,080
		Unit Cost ($/AF):	$80
Totals (without CVP allocation):	3,750,347		$612,963,171
		Unit Cost ($/AF):	$163

C—100422

Service Area "F" Resource Alternative 2 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 Quantity (AF/yr)	Conservation Program 2 Escalated Capital Cost	Conservation Program 2 Escalated O&M Cost	Conservation Program 2 Total Present Worth Cost	CCCSD Zone 1 Project Quantity (AF/yr)	Historical Demand (AF/yr) [b]	Normal Year CVP Contract (AF/yr) [c]	Normal Year Net Deficit (AF/yr)	Drought Year Cutback: 25% CVP Contract (AF/yr) [d]	Drought Year Net Deficit (AF/yr)	CVP Raw Water Allocation [c] Quantity (AF/yr)	CVP Raw Water Allocation [c] Escalated Capital Cost	CVP Raw Water Allocation [c] Escalated O&M Cost	CVP Raw Water Allocation [c] Total Present Worth Cost
Capital Cost (1995): - O&M Cost (1995): -												Capital Cost (1995): - O&M Cost (1995): $56			
1997	183,800	1,936	$1,667,000	$1,667,000	125	181,740	195,000	0	138,500	43,500	184,000		$10,255,936	$10,255,936	
1998	187,167	2,580	$1,805,000	$1,507,042	249	184,338	195,000	0	138,253	-	184,338		$11,611,869	$10,903,163	
1999	190,533	3,225	$2,086,000	$1,839,141	374	186,934	195,000	0	140,201	-	186,934		$12,246,457	$10,797,202	
2000	193,900	3,870	$2,604,000	$2,155,719	498	189,532	195,000	0	142,149	-	189,532		$12,913,301	$10,690,264	
2001	197,960	4,543	$2,743,000	$2,132,197	623	192,794	195,000	0	144,596	-	192,794		$13,660,971	$10,618,988	
2002	202,020	5,215	$2,890,000	$2,109,356	684	196,141	195,000	1,141	161,250	-	195,000		$14,369,975	$10,488,369	
2003	206,080	5,888	$3,044,000	$2,088,157	706	199,486	195,000	4,486	161,250	-	195,000		$14,944,774	$10,242,164	
2004	210,140	6,560	$3,206,000	$2,067,437	747	202,833	195,000	7,833	161,250	-	195,000		$15,512,805	$10,000,667	
2005	214,200	7,233	$3,375,000	$2,039,280	789	206,178	195,000	11,178	161,250	-	195,000		$16,164,268	$9,766,955	
2006	218,260	7,905	$3,553,000	$2,015,806	830	209,525	195,000	14,525	161,250	-	195,000		$16,810,838	$9,537,683	
2007	222,320	8,578	$3,740,000	$1,992,395	830	212,912	195,000	17,912	161,250	-	195,000		$17,483,272	$9,313,794	
2008	226,380	9,250	$3,936,000	$1,968,835	830	216,300	195,000	21,300	161,250	-	195,000		$18,182,503	$9,095,160	
2009	230,440	9,923	$4,142,000	$1,945,426	830	219,687	195,000	24,687	161,250	-	195,000		$18,909,907	$8,881,659	
2010	234,500	10,595	$4,358,000	$1,921,951	830	223,075	195,000	28,075	161,250	-	195,000		$19,666,303	$8,673,189	
2011	238,560	11,268	$4,585,000	$1,898,650	830	226,262	166,000	60,262	139,500	26,762	166,000		$20,451,755	$8,469,603	
2012	242,220	11,940	$4,823,000	$1,875,310	830	229,450	166,000	63,450	139,500	-	166,000		$18,107,683	$7,040,747	
2013	246,080	12,613	$5,073,000	$1,852,129	830	232,637	166,000	66,637	139,500	-	166,000		$18,831,990	$6,875,472	
2014	249,940	13,285	$5,335,000	$1,828,905	830	235,825	166,000	69,825	139,500	-	166,000		$19,585,270	$6,714,076	
2015	253,800	13,958	$5,609,000	$1,805,479	830	239,012	166,000	73,012	139,500	-	166,000		$20,368,681	$6,556,468	
2016	257,660	14,630	$5,897,000	$1,782,332	830	242,200	166,000	76,200	139,500	-	166,000		$21,183,428	$6,402,561	
2017	261,520	15,303	$6,200,000	$1,759,542	830	245,387	166,000	79,387	139,500	-	166,000		$22,030,765	$6,252,266	
2018	265,380	15,975	$6,517,000	$1,736,825	830	248,575	166,000	82,575	139,500	109,075	166,000		$19,224,956	$5,130,826	
2019	269,240	16,648	$6,849,000	$1,713,704	830	251,762	166,000	85,762	139,500	-	166,000		$23,828,476	$5,962,177	
2020	273,100	17,320	$7,198,000	$1,691,106	830	254,950	166,000	88,950	139,500	-	166,000		$24,781,615	$5,822,220	
2021	274,580	17,712	$7,450,000	$1,643,485	830	256,038	166,000	90,038	139,500	-	166,000		$25,772,879	$5,685,548	
2022	276,060	18,103	$7,710,000	$1,597,034	830	257,127	166,000	91,127	139,500	-	166,000		$26,803,794	$5,552,085	
2023	277,540	18,495	$7,980,000	$1,552,076	830	258,215	166,000	92,215	139,500	-	166,000		$27,875,946	$5,421,754	
2024	279,020	18,886	$8,258,000	$1,508,119	830	259,304	166,000	93,304	139,500	-	166,000		$28,990,984	$5,294,483	
2025	280,500	19,278	$8,548,000	$1,465,480	830	260,392	166,000	94,392	139,500	20,892	166,000		$25,587,742	$4,344,836	
2026	281,980	19,669	$8,844,000	$1,424,000	830	261,481	166,000	95,481	139,500	-	166,000		$31,356,648	$5,048,833	
2027	283,460	20,061	$9,153,000	$1,383,806	830	262,569	166,000	96,569	139,500	-	166,000		$32,610,914	$4,930,318	
2028	284,940	20,452	$9,471,000	$1,344,491	830	263,658	166,000	97,658	139,500	-	166,000		$33,915,351	$4,814,581	
2029	286,420	20,844	$9,801,000	$1,306,420	830	264,746	166,000	98,746	139,500	-	166,000		$35,271,965	$4,701,562	
2030	287,900	21,235	$10,141,000	$1,269,240	830	265,835	166,000	99,835	139,500	-	166,000		$36,682,843	$4,591,197	
2031	288,810	21,627	$10,494,000	$1,233,259	830	266,353	166,000	100,353	139,500	-	166,000		$38,150,157	$4,483,422	
2032	289,720	22,018	$10,858,000	$1,198,117	830	266,872	166,000	100,872	139,500	27,372	166,000		$33,762,418	$3,724,262	
2033	290,630	22,410	$11,235,000	$1,164,092	830	267,390	166,000	101,390	139,500	-	166,000		$41,263,210	$4,275,404	
2034	291,540	22,801	$11,624,000	$1,130,889	830	267,909	166,000	101,909	139,500	-	166,000		$42,913,738	$4,175,042	
2035	292,450	23,193	$12,027,000	$1,098,683	830	268,427	166,000	102,427	139,500	-	166,000		$44,630,288	$4,077,036	
2036	293,360	23,584	$12,443,000	$1,067,310	830	268,946	166,000	102,946	139,500	-	166,000		$46,415,499	$3,981,331	
2037	294,270	23,976	$12,873,000	$1,036,801	830	269,464	166,000	103,464	139,500	-	166,000		$48,272,119	$3,887,873	
2038	295,180	24,367	$13,318,000	$1,007,175	830	269,983	166,000	103,983	139,500	-	166,000		$50,203,004	$3,796,608	
2039	296,090	24,759	$13,777,000	$978,291	830	270,501	166,000	104,501	139,500	27,001	166,000		$52,210,214	$3,707,484	
2040	297,000	25,150	$14,252,000	$950,261	830	271,020	166,000	105,020	139,500	-	166,000		$54,299,569	$3,620,456	
Subtotals:	11,216,450	658,860		$70,235,580	33,825	10,523,765						7,458,653			$287,828,242
		5.9%	Unit Cost ($/AF avoided):	$107	0.3%	93.8%						66.5%	Unit Cost ($/AF purchased):	$39	

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100423

Service Area "F" Resource Alternative 2 Present Worth

Year	Net Deficit (AF/yr)	ECCID Quantity (AF/yr)	ECCID Escalated Capital Cost	ECCID Escalated O&M Cost	ECCID Total Present Worth Cost	Surface Water Transfer Quantity (AF/yr)	Surface Water Transfer Escalated Capital Cost	Surface Water Transfer Escalated O&M Cost	Surface Water Transfer Total Present Worth Cost	Spot Surface Water Transfer Quantity (AF/yr)	Spot Surface Water Transfer Escalated Capital Cost	Spot Surface Water Transfer Escalated O&M Cost	Spot Surface Water Transfer Total Present Worth Cost
		Capital Cost (1995): -		O&M Cost (1995): $63		Capital Cost (1995): -		O&M Cost (1995): $175		Capital Cost (1995): -		O&M Cost (1995): $300	
1997	[illegible]	8,000		$504,000	$504,000	[illegible]		$0	$0	37,155		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	1,141	1,141		$71,883	$52,466	0		$0	$0	0		$0	$0
2003	4,486	4,486		$282,618	$193,688	0		$0	$0	0		$0	$0
2004	[illegible]	15,000		$945,000	[illegible]	0		$0	[illegible]	[illegible]		[illegible]	[illegible]
2005	11,178	11,178		$704,214	$425,508	0		$0	$0	0		$0	$0
2006	14,525	14,525		$915,075	$519,171	0		$0	$0	0		$0	$0
2007	17,912	15,000		$945,000	$503,428	2,912		$1,084,987	$578,001	0		$0	$0
2008	21,300	15,000		$945,000	$472,701	6,300		$2,499,905	$1,250,483	0		$0	$0
2009	24,687	15,000		$945,000	$443,850	9,687		$4,093,755	$1,922,767	0		$0	$0
2010	28,075	21,000		$1,323,000	$583,465	7,075		$3,184,261	$1,404,312	0		$0	$0
2011	[illegible]	21,000		$1,323,000	[illegible]	39,262		[illegible]	[illegible]	26,500		[illegible]	$9,017,069
2012	63,450	21,000		$1,323,000	$514,417	42,450		$21,670,008	$8,425,874	0		$0	$0
2013	66,637	21,000		$1,323,000	$483,021	45,637		$24,811,218	$9,058,460	0		$0	$0
2014	69,825	21,000		$1,323,000	$453,541	48,825		$28,269,807	$9,691,244	0		$0	$0
2015	73,012	21,000		$1,323,000	$425,860	52,012		$32,072,570	$10,323,829	0		$0	$0
2016	76,200	21,000		$1,323,000	$399,869	55,200		$36,250,908	$10,958,614	0		$0	$0
2017	79,387	21,000		$1,323,000	$375,463	58,387		$40,836,224	$11,589,199	0		$0	$0
2018	109,075	21,000		$1,323,000	[illegible]	61,575		[illegible]	[illegible]	26,500		[illegible]	$9,017,069
2019	85,762	21,000		$1,323,000	$331,031	64,762		$51,374,651	$12,854,569	0		$0	$0
2020	88,950	21,000		$1,323,000	$310,827	67,950		$57,407,377	$13,487,353	0		$0	$0
2021	90,038	21,000		$1,323,000	$291,856	69,038		$62,117,798	$13,703,309	0		$0	$0
2022	91,127	21,000		$1,323,000	$274,044	70,127		$67,198,986	$13,919,464	0		$0	$0
2023	92,215	21,000		$1,323,000	$257,318	71,215		$72,677,260	$14,135,421	0		$0	$0
2024	93,304	21,000		$1,323,000	$241,613	72,304		$78,584,881	$14,351,576	0		$0	$0
2025	120,892	21,000		$1,323,000	$226,867	73,392		[illegible]	[illegible]	26,500		[illegible]	$9,017,069
2026	95,481	21,000		$1,323,000	$213,020	74,481		$91,816,638	$14,783,687	0		$0	$0
2027	96,569	21,000		$1,323,000	$200,019	75,569		$99,213,135	$14,999,644	0		$0	$0
2028	97,658	21,000		$1,323,000	$187,811	76,658		$107,184,649	$15,215,799	0		$0	$0
2029	98,746	21,000		$1,323,000	$176,349	77,746		$115,771,795	$15,431,755	0		$0	$0
2030	99,835	21,000		$1,323,000	$165,586	78,835		$125,024,001	$15,647,910	0		$0	$0
2031	100,353	21,000		$1,323,000	$155,480	79,353		$134,026,451	$15,750,727	0		$0	$0
2032	127,372	21,000		$1,323,000	[illegible]	79,872		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2033	101,390	21,000		$1,323,000	$137,080	80,390		$154,001,579	$15,956,561	0		$0	$0
2034	101,909	21,000		$1,323,000	$128,714	80,909		$165,070,545	$16,059,577	0		$0	$0
2035	102,427	21,000		$1,323,000	$120,858	81,427		$176,925,648	$16,162,394	0		$0	$0
2036	102,946	21,000		$1,323,000	$113,482	81,946		$189,626,606	$16,265,410	0		$0	$0
2037	103,464	21,000		$1,323,000	$106,555	82,464		$203,229,137	$16,368,228	0		$0	$0
2038	103,983	21,000		$1,323,000	$100,052	82,983		$217,801,223	$16,471,244	0		$0	$0
2039	[illegible]	21,000		$1,323,000	[illegible]	83,501		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2040	105,020	21,000		$1,323,000	$88,212	84,020		$250,122,681	$16,677,077	0		$0	$0
Subtotals:	3,065,112	750,330			$11,925,671	2,118,264			$420,452,897	196,518			$66,868,669
	27.3%	*6.7%*		Unit Cost ($/AF purchased):	$16	*18.9%*		Unit Cost ($/AF purchased):	$198	*1.8%*		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	11,216,450		$857,311,080
		Unit Cost ($/AF):	$76
Totals (without CVP allocation):	3,757,797		$569,482,837
		Unit Cost ($/AF):	$152

C—100424

C-100425

Service Area "F" Resource Alternative 3 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 2 — Capital Cost (1995): - O&M Cost (1995): - — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	CCCSD Zone 1 Project — Quantity (AF/yr)	Historical Demand (AF/yr) [b]	Normal Year — CVP Contract (AF/yr) [c]	Normal Year — Net Deficit (AF/yr)	Drought Year (Cutback: 25%) — CVP Contract (AF/yr) [d]	Drought Year — Net Deficit (AF/yr)	CVP Raw Water Allocation [c] — Capital Cost (1995): - O&M Cost (1995): $56 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	183,800	1,935		$1,157,000	$1,157,000	125	181,740	195,000	[illegible]	136,306	45,435	136,306		$8,255,939	$8,255,939
1998	187,167	2,580		$1,605,000	$1,507,042	249	184,338	195,000	0	138,253	-	184,338		$11,611,869	$10,903,163
1999	190,533	3,225		$2,086,000	$1,839,141	374	186,934	195,000	0	140,201	-	186,934		$12,246,457	$10,797,202
2000	193,900	3,870		$2,604,000	$2,155,719	498	189,532	195,000	0	142,149	-	189,532		$12,913,301	$10,690,264
2001	197,960	4,543		$2,743,000	$2,132,197	623	192,794	195,000	0	144,596	-	192,794		$13,660,971	$10,618,988
2002	202,020	5,215		$2,890,000	$2,109,356	664	196,141	195,000	1,141	161,250	-	195,000		$14,369,975	$10,488,369
2003	206,080	5,888		$3,044,000	$2,086,157	706	199,486	195,000	4,486	161,250	-	195,000		$14,944,774	$10,242,164
2004	210,140	6,560		$3,206,000	$2,062,437	747	202,833	195,000	7,833	161,250	41,583	161,250		$12,852,506	$8,270,887
2005	214,200	7,233		$3,375,000	$2,039,280	789	206,178	195,000	11,178	161,250	-	195,000		$16,164,268	$9,768,955
2006	218,260	7,905		$3,553,000	$2,015,806	830	209,525	195,000	14,525	161,250	-	195,000		$16,810,838	$9,537,683
2007	222,320	8,578		$3,740,000	$1,992,395	830	212,912	195,000	17,912	161,250	-	195,000		$17,483,272	$9,313,794
2008	226,380	9,250		$3,936,000	$1,968,835	830	216,300	195,000	21,300	161,250	-	195,000		$18,182,603	$9,095,160
2009	230,440	9,923		$4,142,000	$1,945,426	830	219,687	195,000	24,687	161,250	-	195,000		$18,909,907	$8,881,659
2010	234,500	10,595		$4,358,000	$1,921,951	830	223,075	195,000	28,075	161,250	-	195,000		$19,666,303	$8,673,169
2011	238,360	11,268		$4,585,000	$1,898,650	830	226,262	166,000	60,262	139,500	86,762	139,500		$14,631,729	$6,059,003
2012	242,220	11,940		$4,823,000	$1,875,310	830	229,450	166,000	63,450	139,500	-	166,000		$18,107,683	$7,040,747
2013	246,080	12,613		$5,073,000	$1,852,129	830	232,637	166,000	66,637	139,500	-	166,000		$18,831,990	$6,875,472
2014	249,940	13,285		$5,335,000	$1,828,905	830	235,825	166,000	69,825	139,500	-	166,000		$19,585,270	$6,714,076
2015	253,800	13,958		$5,609,000	$1,805,479	830	239,012	166,000	73,012	139,500	-	166,000		$20,368,681	$6,556,468
2016	257,660	14,630		$5,897,000	$1,782,332	830	242,200	166,000	76,200	139,500	-	166,000		$21,183,428	$6,402,561
2017	261,520	15,303		$6,200,000	$1,759,542	830	245,387	166,000	79,387	139,500	-	166,000		$22,030,765	$6,252,266
2018	265,380	15,975		$6,512,000	$1,736,626	830	248,575	166,000	82,575	139,500	109,075	139,500		[illegible]	$5,130,826
2019	269,240	16,648		$6,849,000	$1,713,704	830	251,762	166,000	85,762	139,500	-	166,000		$23,828,476	$5,962,177
2020	273,100	17,320		$7,198,000	$1,691,106	830	254,950	166,000	88,950	139,500	-	166,000		$24,781,615	$5,822,220
2021	274,580	17,712		$7,450,000	$1,643,485	830	256,038	166,000	90,038	139,500	-	166,000		$25,772,879	$5,685,548
2022	276,060	18,103		$7,710,000	$1,597,034	830	257,127	166,000	91,127	139,500	-	166,000		$26,803,794	$5,552,085
2023	277,540	18,495		$7,980,000	$1,552,076	830	258,215	166,000	92,215	139,500	-	166,000		$27,875,946	$5,421,754
2024	279,020	18,886		$8,258,000	$1,508,119	830	259,304	166,000	93,304	139,500	-	166,000		$28,990,984	$5,294,483
2025	280,500	19,278		$8,546,000	[illegible]	830	260,392	166,000	94,392	139,500	120,892	139,500		[illegible]	[illegible]
2026	281,980	19,669		$8,844,000	$1,424,000	830	261,481	166,000	95,481	139,500	-	166,000		$31,356,648	$5,048,833
2027	283,460	20,061		$9,153,000	$1,383,806	830	262,569	166,000	96,569	139,500	-	166,000		$32,610,914	$4,930,318
2028	284,940	20,452		$9,471,000	$1,344,491	830	263,658	166,000	97,658	139,500	-	166,000		$33,915,351	$4,814,581
2029	286,420	20,844		$9,801,000	$1,306,420	830	264,746	166,000	98,746	139,500	-	166,000		$35,271,965	$4,701,562
2030	287,900	21,235		$10,141,000	$1,269,240	830	265,835	166,000	99,835	139,500	-	166,000		$36,682,843	$4,591,197
2031	288,810	21,627		$10,494,000	$1,233,259	830	266,353	166,000	100,353	139,500	-	166,000		$38,150,157	$4,483,422
2032	289,720	22,018		$10,858,000	$1,198,157	830	266,872	166,000	100,872	139,500	127,372	139,500		$33,342,418	$3,879,252
2033	290,630	22,410		$11,235,000	$1,164,092	830	267,390	166,000	101,390	139,500	-	166,000		$41,263,210	$4,275,404
2034	291,540	22,801		$11,624,000	$1,130,889	830	267,909	166,000	101,909	139,500	-	166,000		$42,913,738	$4,175,042
2035	292,450	23,193		$12,027,000	$1,098,683	830	268,427	166,000	102,427	139,500	-	166,000		$44,630,288	$4,077,038
2036	293,360	23,584		$12,443,000	$1,067,310	830	268,946	166,000	102,946	139,500	-	166,000		$46,415,499	$3,981,331
2037	294,270	23,976		$12,873,000	$1,036,801	830	269,464	166,000	103,464	139,500	-	166,000		$48,272,119	$3,887,873
2038	295,180	24,367		$13,318,000	$1,007,175	830	269,983	166,000	103,983	139,500	-	166,000		$50,203,004	$3,796,608
2039	296,090	24,759		$13,772,000	[illegible]	830	270,501	166,000	104,501	139,500	131,001	139,500		$43,875,216	$3,116,628
2040	297,000	25,150		$14,252,000	$950,261	830	271,020	166,000	105,020	139,500	-	166,000		$54,299,569	$3,620,456
Subtotals:	11,216,450	658,860			$70,235,580	33,825	10,523,765					7,458,653			$287,828,242
		5.9%		Unit Cost ($/AF avoided):	$107	*0.3%*	*93.8%*					*66.5%*		Unit Cost ($/AF purchased):	$39

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100425

C-100426

Service Area "F" Resource Alternative 3 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation — Capital Cost (1995): $24,660,000; O&M Cost (1995): $337				Antioch Urban Irrigation — Capital Cost (1995): $72,940,000; O&M Cost (1995): $320				ECCID — Capital Cost (1995): -; O&M Cost (1995): $63			
		Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	45,436	0		$0	$0	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	1,141	0		$0	$0	0		$0	$0	1,141		$71,883	$52,466
2003	4,486	0		$0	$0	0		$0	$0	4,486		$282,618	$193,688
2004	[illegible]	0		$0	$0	0		$0	$0	15,000		[illegible]	[illegible]
2005	11,178	0		$0	$0	0		$0	$0	11,178		$704,214	$425,508
2006	14,525	0		$0	$0	0		$0	$0	14,525		$915,075	$519,171
2007	17,912	0		$0	$0	0		$0	$0	15,000		$945,000	$503,426
2008	21,300	0		$0	$0	0		$0	$0	15,000		$945,000	$472,701
2009	24,687	0		$0	$0	0		$0	$0	15,000		$945,000	$443,850
2010	28,075	0		$0	$0	0		$0	$0	21,000		$1,323,000	$583,465
2011	[illegible]	0		$0	$0	0		$0	$0	21,000		[illegible]	[illegible]
2012	63,450	0		$0	$0	0		$0	$0	21,000		$1,323,000	$514,417
2013	66,637	0		$0	$0	0		$0	$0	21,000		$1,323,000	$483,021
2014	69,825	0		$0	$0	0		$0	$0	21,000		$1,323,000	$453,541
2015	73,012	0		$0	$0	0		$0	$0	21,000		$1,323,000	$425,860
2016	76,200	0		$0	$0	0		$0	$0	21,000		$1,323,000	$399,869
2017	79,387	0	$29,221,099	$0	$8,292,861	0	$86,430,938	$0	$24,528,844	21,000		$1,323,000	$375,463
2018	109,075	0	[illegible]	$0	[illegible]	0	[illegible]	$0	[illegible]	21,000		[illegible]	[illegible]
2019	85,762	0		$0	$0	0		$0	$0	21,000		$1,323,000	$331,031
2020	88,950	1,687		$1,515,579	$356,072	6,280		$5,357,265	$1,258,642	21,000		$1,323,000	$310,827
2021	90,038	1,687		$1,576,202	$347,713	6,280		$5,571,555	$1,229,096	21,000		$1,323,000	$291,856
2022	91,127	1,687		$1,639,250	$339,551	6,280		$5,794,417	$1,200,244	21,000		$1,323,000	$274,044
2023	92,215	1,687		$1,704,820	$331,580	6,280		$6,026,194	$1,172,069	21,000		$1,323,000	$257,318
2024	93,304	1,687		$1,773,013	$323,797	6,280		$6,267,242	$1,144,556	21,000		$1,323,000	$241,613
2025	120,892	1,687		[illegible]	[illegible]	6,280		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2026	95,481	1,687		$1,917,690	$308,773	6,280		$6,778,649	$1,091,452	21,000		$1,323,000	$213,020
2027	96,569	1,687		$1,994,398	$301,525	6,280		$7,049,795	$1,065,831	21,000		$1,323,000	$200,019
2028	97,658	1,687		$2,074,174	$294,447	6,280		$7,331,787	$1,040,811	21,000		$1,323,000	$187,811
2029	98,746	1,687		$2,157,141	$287,535	6,280		$7,625,058	$1,016,379	21,000		$1,323,000	$176,349
2030	99,835	1,687		$2,243,427	$280,786	6,280		$7,930,060	$992,520	21,000		$1,323,000	$165,588
2031	100,353	1,687		$2,333,164	$274,194	6,280		$8,247,263	$969,222	21,000		$1,323,000	$155,480
2032	[illegible]	1,687		[illegible]	[illegible]	6,280		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2033	101,390	1,687		$2,523,550	$261,472	6,280		$8,920,240	$924,253	21,000		$1,323,000	$137,080
2034	101,909	1,687		$2,624,492	$255,335	6,280		$9,277,049	$902,556	21,000		$1,323,000	$128,714
2035	102,427	1,687		$2,729,471	$249,341	6,280		$9,648,131	$881,370	21,000		$1,323,000	$120,858
2036	102,946	1,687		$2,838,650	$243,488	6,280		$10,034,056	$860,680	21,000		$1,323,000	$113,482
2037	103,464	1,687		$2,952,196	$237,772	6,280		$10,435,419	$840,476	21,000		$1,323,000	$106,555
2038	103,983	1,687		$3,070,284	$232,191	6,280		$10,852,835	$820,747	21,000		$1,323,000	$100,052
2039	131,001	1,687		[illegible]	[illegible]	6,280		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2040	105,020	1,687		$3,320,819	$221,418	6,280		$11,738,427	$782,667	21,000		$1,323,000	$88,212
Subtotals:	3,065,112	35,427			$22,348,738	131,880			$69,541,103	750,330			$11,925,671
	27.3%	*0.3%*		Unit Cost ($/AF):	$631	*1.2%*		Unit Cost ($/AF):	$527	*6.7%*		Unit Cost ($/AF purchased):	$16

C-100426

Service Area "F" Resource Alternative 3 Present Worth

Year	Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $175 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer Capital Cost (1995): - O&M Cost (1995): $300 Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	[illegible]		[illegible]	[illegible]
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	2,912		$1,084,987	$578,001	0		$0	$0
2008	6,300		$2,499,905	$1,250,483	0		$0	$0
2009	9,687		$4,093,755	$1,922,767	0		$0	$0
2010	7,075		$3,184,261	$1,404,312	0		$0	$0
2011	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	42,450		$21,670,008	$8,425,874	0		$0	$0
2013	45,637		$24,811,218	$9,058,460	0		$0	$0
2014	48,825		$28,269,807	$9,691,244	0		$0	$0
2015	52,012		$32,072,570	$10,323,829	0		$0	$0
2016	55,200		$36,250,908	$10,956,614	0		$0	$0
2017	58,387		$40,836,224	$11,589,199	0		$0	$0
2018	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	64,762		$51,374,651	$12,854,569	0		$0	$0
2020	59,983		$50,676,478	$11,905,988	0		$0	$0
2021	61,071		$54,949,391	$12,121,945	0		$0	$0
2022	62,160		$59,584,632	$12,338,100	0		$0	$0
2023	63,248		$64,546,673	$12,554,056	0		$0	$0
2024	64,337		$69,925,806	$12,770,211	0		$0	$0
2025	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2026	66,514		$81,995,299	$13,202,322	0		$0	$0
2027	67,602		$88,753,409	$13,418,279	0		$0	$0
2028	68,691		$96,045,041	$13,634,434	0		$0	$0
2029	69,779		$103,908,112	$13,850,390	0		$0	$0
2030	70,868		$112,389,179	$14,066,545	0		$0	$0
2031	71,386		$120,569,366	$14,169,363	0		$0	$0
2032	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2033	72,423		$138,739,350	$14,375,196	0		$0	$0
2034	72,942		$148,816,271	$14,478,212	0		$0	$0
2035	73,460		$159,614,846	$14,581,029	0		$0	$0
2036	73,979		$171,190,801	$14,684,045	0		$0	$0
2037	74,497		$183,594,793	$14,786,863	0		$0	$0
2038	75,016		$196,890,647	$14,889,879	0		$0	$0
2039	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	76,053		$226,405,383	$15,095,712	0		$0	$0
Subtotals:	1,950,957 17.4%	Unit Cost ($/AF purchased):		$387,244,236 $198	196,518 1.8%	Unit Cost ($/AF purchased):		$66,868,689 $340

Totals (with CVP allocation):	11,216,450	Unit Cost ($/AF):	$915,992,258 $82
Totals (without CVP allocation):	3,757,797	Unit Cost ($/AF):	$628,164,016 $167

Service Area "F" Resource Alternative 4 Present Worth

		Conservation Program 2				CCCSD Zone 1 Project		Normal Year		Drought Year		CVP Raw Water Allocation [c]			
		Capital Cost (1995): -								Cutback: 25%		Capital Cost (1995): -			
		O&M Cost (1995): -										O&M Cost (1995): $56			
Year	Gross Demand (AF/yr)	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Historical Demand (AF/yr) [b]	CVP Contract (AF/yr) [c]	Net Deficit (AF/yr)	CVP Contract (AF/yr) [d]	Net Deficit (AF/yr)	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	183,800	1,935		$1,157,000	$1,157,000	125	181,740	195,000	0	136,305	45,435	136,305		[illegible]	$8,255,939
1998	187,167	2,580		$1,805,000	$1,507,042	249	184,338	195,000	0	138,253	-	184,338		$11,611,869	$10,903,163
1999	190,533	3,225		$2,086,000	$1,839,141	374	186,934	195,000	0	140,201	-	186,934		$12,246,457	$10,797,202
2000	193,900	3,870		$2,604,000	$2,155,719	498	189,532	195,000	0	142,149	-	189,532		$12,913,301	$10,690,264
2001	197,960	4,543		$2,743,000	$2,132,197	623	192,794	195,000	0	144,596	-	192,794		$13,660,971	$10,618,988
2002	202,020	5,215		$2,890,000	$2,109,358	664	198,141	195,000	1,141	161,250	-	195,000		$14,369,975	$10,488,369
2003	206,080	5,888		$3,044,000	$2,086,157	706	199,486	195,000	4,486	161,250	-	195,000		$14,944,774	$10,242,164
2004	210,140	6,560		$3,205,000	$2,062,437	747	202,833	195,000	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	$8,270,687
2005	214,200	7,233		$3,375,000	$2,039,280	789	206,178	195,000	11,178	161,250	-	195,000		$16,164,268	$9,766,955
2006	218,260	7,905		$3,553,000	$2,015,806	830	209,525	195,000	14,525	161,250	-	195,000		$16,810,838	$9,537,683
2007	222,320	8,578		$3,740,000	$1,992,395	830	212,912	195,000	17,912	161,250	-	195,000		$17,483,272	$9,313,794
2008	226,380	9,250		$3,936,000	$1,968,835	830	216,300	195,000	21,300	161,250	-	195,000		$18,182,603	$9,095,160
2009	230,440	9,923		$4,142,000	$1,945,426	830	219,687	195,000	24,687	161,250	-	195,000		$18,909,907	$8,881,659
2010	234,500	10,595		$4,358,000	$1,921,951	830	223,075	195,000	28,075	161,250	-	195,000		$19,666,303	$8,673,169
2011	238,360	11,268		[illegible]	[illegible]	830	226,262	166,000	60,262	[illegible]	[illegible]	[illegible]		[illegible]	$5,059,003
2012	242,220	11,940		$4,823,000	$1,875,310	830	229,450	166,000	63,450	139,500	-	166,000		$18,107,683	$7,040,747
2013	246,080	12,613		$5,073,000	$1,852,129	830	232,637	166,000	66,637	139,500	-	166,000		$18,831,990	$6,875,472
2014	249,940	13,285		$5,335,000	$1,828,905	830	235,825	166,000	69,825	139,500	-	166,000		$19,585,270	$6,714,076
2015	253,800	13,958		$5,609,000	$1,805,479	830	239,012	166,000	73,012	139,500	-	166,000		$20,368,681	$6,556,468
2016	257,660	14,630		$5,897,000	$1,782,332	830	242,200	166,000	76,200	139,500	-	166,000		$21,183,428	$6,402,561
2017	261,520	15,303		$6,200,000	$1,759,542	830	245,387	166,000	79,387	139,500	-	166,000		$22,030,765	$6,252,266
2018	265,380	15,975		[illegible]	[illegible]	830	[illegible]	166,000	[illegible]	[illegible]	109,075	[illegible]		[illegible]	[illegible]
2019	269,240	16,648		$6,849,000	$1,713,704	830	251,762	166,000	85,762	139,500	-	166,000		$23,828,476	$5,962,177
2020	273,100	17,320		$7,198,000	$1,691,106	830	254,950	166,000	88,950	139,500	-	166,000		$24,781,615	$5,822,220
2021	274,580	17,712		$7,450,000	$1,643,485	830	256,038	166,000	90,038	139,500	-	166,000		$25,772,879	$5,685,548
2022	276,060	18,103		$7,710,000	$1,597,034	830	257,127	166,000	91,127	139,500	-	166,000		$26,803,794	$5,552,085
2023	277,540	18,495		$7,980,000	$1,552,076	830	258,215	166,000	92,215	139,500	-	166,000		$27,875,946	$5,421,754
2024	279,020	18,886		$8,258,000	$1,508,119	830	259,304	166,000	93,304	139,500	-	166,000		$28,990,984	$5,294,483
2025	280,500	19,278		$8,546,000	$1,465,480	830	260,392	166,000	94,392	[illegible]	120,892	[illegible]		$25,337,421	$4,344,836
2026	281,980	19,669		$8,844,000	$1,424,000	830	261,481	166,000	95,481	139,500	-	166,000		$31,356,648	$5,048,833
2027	283,460	20,061		$9,153,000	$1,383,806	830	262,569	166,000	96,569	139,500	-	166,000		$32,610,914	$4,930,316
2028	284,940	20,452		$9,471,000	$1,344,491	830	263,658	166,000	97,658	139,500	-	166,000		$33,915,351	$4,814,581
2029	286,420	20,844		$9,801,000	$1,306,420	830	264,746	166,000	98,746	139,500	-	166,000		$35,271,965	$4,701,562
2030	287,900	21,235		$10,141,000	$1,269,240	830	265,835	166,000	99,835	139,500	-	166,000		$36,682,843	$4,591,197
2031	288,810	21,627		$10,494,000	$1,233,259	830	266,353	166,000	100,353	139,500	-	166,000		$38,150,157	$4,483,422
2032	289,720	22,018		[illegible]	[illegible]	830	266,872	166,000	[illegible]	[illegible]	127,372	[illegible]		[illegible]	$3,679,262
2033	290,630	22,410		$11,235,000	$1,164,092	830	267,390	166,000	101,390	139,500	-	166,000		$41,263,210	$4,275,404
2034	291,540	22,801		$11,624,000	$1,130,889	830	267,909	166,000	101,909	139,500	-	166,000		$42,913,738	$4,175,042
2035	292,450	23,193		$12,027,000	$1,098,683	830	268,427	166,000	102,427	139,500	-	166,000		$44,630,288	$4,077,036
2036	293,360	23,584		$12,443,000	$1,067,310	830	268,946	166,000	102,946	139,500	-	166,000		$46,415,499	$3,981,331
2037	294,270	23,976		$12,873,000	$1,036,801	830	269,464	166,000	103,464	139,500	-	166,000		$48,272,119	$3,887,873
2038	295,180	24,367		$13,318,000	$1,007,175	830	269,983	166,000	103,983	139,500	-	166,000		$50,203,004	$3,796,608
2039	296,090	24,759		[illegible]	[illegible]	830	270,501	166,000	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	297,000	25,150		$14,252,000	$950,261	830	271,020	166,000	105,020	139,500	-	166,000		$54,299,569	$3,620,456
Subtotals:	11,216,450	658,860			$70,235,590	33,825	10,523,765					7,458,653			$287,828,242
		5.9%		Unit Cost ($/AF avoided):	$107	0.3%	93.8%					66.5%		Unit Cost ($/AF purchased):	$39

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C-100428

Service Area "F" Resource Alternative 4 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation — Capital Cost (1995): $24,660,000; O&M Cost (1995): $337 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Antioch Urban Irrigation — Capital Cost (1995): $72,940,000; O&M Cost (1995): $320 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Central County Industrial (Cooling Towers) — Capital Cost (1995): $48,460,000; O&M Cost (1995): $935 — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	45,435	0		$0	$0	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	1,141	0		$0	$0	0		$0	$0	0		$0	$0
2003	4,486	0		$0	$0	0		$0	$0	0		$0	$0
2004	41,583	0		$0	$0	0		$0	$0	0		$0	$0
2005	11,178	0		$0	$0	0		$0	$0	0		$0	$0
2006	14,525	0.		$0	$0	0		$0	$0	0		$0	$0
2007	17,912	0		$0	$0	0		$0	$0	0		$0	$0
2008	21,300	0		$0	$0	0		$0	$0	0	$40,344,731	$0	$20,180,928
2009	24,687	0		$0	$0	0		$0	$0	0	$41,958,520	$0	$19,707,198
2010	28,075	0		$0	$0	0		$0	$0	0		$0	$0
2011	56,762	0		$0	$0	0		$0	$0	13,300		$23,291,458	$9,644,999
2012	63,450	0		$0	$0	0		$0	$0	13,300		$24,223,117	$9,418,590
2013	66,637	0		$0	$0	0		$0	$0	13,300		$25,192,041	$9,197,497
2014	69,825	0		$0	$0	0		$0	$0	13,300		$26,199,723	$8,981,593
2015	73,012	0		$0	$0	0		$0	$0	13,300		$27,247,712	$8,770,757
2016	76,200	0		$0	$0	0		$0	$0	13,300		$28,337,620	$8,564,871
2017	79,387	0	$29,221,099	$0	$8,292,861	0	$86,430,938	$0	$24,528,844	13,300		$29,471,125	$8,363,818
2018	109,075	0	$30,389,943	$0	$8,096,193	0	$89,888,176	$0	$23,953,049	13,300		$30,649,970	$8,167,484
2019	85,762	0		$0	$0	0		$0	$0	13,300		$31,875,969	$7,975,759
2020	88,950	1,687		$1,515,579	$356,072	6,280		$5,357,265	$1,258,642	13,300		$33,151,008	$7,788,535
2021	90,038	1,687		$1,576,202	$347,713	6,280		$5,571,555	$1,229,098	13,300		$34,477,048	$7,605,705
2022	91,127	1,687		$1,639,250	$339,551	6,280		$5,794,417	$1,200,244	13,300		$35,856,130	$7,427,168
2023	92,215	1,687		$1,704,820	$331,580	6,280		$6,026,194	$1,172,069	13,300		$37,290,375	$7,252,821
2024	93,304	1,687		$1,773,013	$323,797	6,280		$6,267,242	$1,144,556	13,300		$38,781,990	$7,082,567
2025	120,892	1,687		$1,843,933	$316,196	6,280		$6,517,932	$1,117,689	13,300		$40,333,270	$6,916,309
2026	95,481	1,687		$1,917,690	$308,773	6,280		$6,778,649	$1,091,452	13,300		$41,946,601	$6,753,955
2027	96,569	1,687		$1,994,398	$301,525	6,280		$7,049,795	$1,065,831	13,300		$43,624,465	$6,595,411
2028	97,658	1,687		$2,074,174	$294,447	6,280		$7,331,787	$1,040,811	13,300		$45,369,443	$6,440,589
2029	98,746	1,687		$2,157,141	$287,535	6,280		$7,625,058	$1,016,379	13,300		$47,184,221	$6,289,402
2030	99,835	1,687		$2,243,427	$280,786	6,280		$7,930,060	$992,520	13,300		$49,071,590	$6,141,763
2031	100,353	1,687		$2,333,164	$274,194	6,280		$8,247,263	$969,222	13,300		$51,034,453	$5,997,590
2032	127,372	1,687		$2,426,490	$267,758	6,280		$8,577,150	$946,470	13,300		$53,075,831	$5,856,802
2033	101,390	1,687		$2,523,550	$261,472	6,280		$8,920,240	$924,253	13,300		$55,198,865	$5,719,318
2034	101,909	1,687		$2,624,492	$255,335	6,280		$9,277,049	$902,556	13,300		$57,406,819	$5,585,062
2035	102,427	1,687		$2,729,471	$249,341	6,280		$9,648,131	$881,370	13,300		$59,703,092	$5,453,957
2036	102,946	1,687		$2,838,650	$243,488	6,280		$10,034,056	$860,680	13,300		$62,091,216	$5,325,930
2037	103,464	1,687		$2,952,196	$237,772	6,280		$10,435,419	$840,476	13,300		$64,574,864	$5,200,908
2038	103,983	1,687		$3,070,284	$232,191	6,280		$10,852,835	$820,747	13,300		$67,157,859	$5,078,821
2039	131,001	1,687		$3,193,096	$226,740	6,280		$11,286,949	$801,481	13,300		$69,844,173	$4,959,600
2040	105,020	1,687		$3,320,819	$221,418	6,280		$11,738,427	$782,667	13,300		$72,637,940	$4,843,177
Subtotals:	3,065,112	35,427			$22,348,738	131,880			$69,541,103	399,000			$249,288,885
	27.3%	0.3%		Unit Cost ($/AF):	$631	1.2%		Unit Cost ($/AF):	$527	3.6%		Unit Cost ($/AF):	$625

C-100429

C-100429

Service Area "F" Resource Alternative 4 Present Worth

Year	Central County Industrial (Boiler Feed)				ECCID			
	Capital Cost (1995): $119,220,000 O&M Cost (1995): $1,460				Capital Cost (1995): - O&M Cost (1995): $63			
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	0		$0	$0	8,000		$504,000	$504,000
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	1,141		$71,883	$52,466
2003	0		$0	$0	4,486		$282,618	$193,688
2004	0		$0	$0	15,000		$945,000	[illegible]
2005	0		$0	$0	11,178		$704,214	$425,508
2006	0		$0	$0	14,525		$915,075	$519,171
2007	0		$0	$0	15,000		$945,000	$503,426
2008	0	$99,255,032	$0	$49,648,582	15,000		$945,000	$472,701
2009	0	$103,225,233	$0	$48,483,122	15,000		$945,000	$443,850
2010	0		$0	$0	21,000		$1,323,000	$583,465
2011	12,200		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2012	12,200		$34,696,004	$13,490,727	21,000		$1,323,000	$514,417
2013	12,200		$36,083,844	$13,174,043	21,000		$1,323,000	$483,021
2014	12,200		$37,527,198	$12,864,793	21,000		$1,323,000	$453,541
2015	12,200		$39,028,285	$12,562,803	21,000		$1,323,000	$425,860
2016	12,200		$40,589,417	$12,267,901	21,000		$1,323,000	$399,869
2017	12,200		$42,212,994	$11,979,922	21,000		$1,323,000	$375,463
2018	12,200		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2019	12,200		$45,657,574	$11,424,086	21,000		$1,323,000	$331,031
2020	12,200		$47,483,877	$11,155,915	21,000		$1,323,000	$310,827
2021	12,200		$49,383,232	$10,894,039	21,000		$1,323,000	$291,856
2022	12,200		$51,358,561	$10,638,310	21,000		$1,323,000	$274,044
2023	12,200		$53,412,904	$10,388,585	21,000		$1,323,000	$257,318
2024	12,200		$55,549,420	$10,144,721	21,000		$1,323,000	$241,613
2025	12,200		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2026	12,200		$60,082,252	$9,674,033	21,000		$1,323,000	$213,020
2027	12,200		$62,485,542	$9,446,943	21,000		$1,323,000	$200,019
2028	12,200		$64,984,964	$9,225,184	21,000		$1,323,000	$187,811
2029	12,200		$67,584,363	$9,008,630	21,000		$1,323,000	$176,349
2030	12,200		$70,287,737	$8,797,160	21,000		$1,323,000	$165,586
2031	12,200		$73,099,247	$8,590,654	21,000		$1,323,000	$155,480
2032	12,200		$76,023,217	[illegible]	21,000		$1,323,000	[illegible]
2033	12,200		$79,064,145	$8,192,071	21,000		$1,323,000	$137,060
2034	12,200		$82,226,711	$7,999,769	21,000		$1,323,000	$128,714
2035	12,200		$85,515,779	$7,811,981	21,000		$1,323,000	$120,858
2036	12,200		$88,936,411	$7,628,601	21,000		$1,323,000	$113,482
2037	12,200		$92,493,867	$7,449,526	21,000		$1,323,000	$106,555
2038	12,200		$96,193,622	$7,274,654	21,000		$1,323,000	$100,052
2039	12,200		[illegible]	[illegible]	21,000		$1,323,000	[illegible]
2040	12,200		$104,043,021	$6,937,130	21,000		$1,323,000	$88,212
Subtotals:	366,000			$398,067,076	750,330			$11,926,671
	3.3%		Unit Cost ($/AF):	$1,088	*6.7%*		Unit Cost ($/AF purchased):	$16

C-100430

C-100430

Service Area "F" Resource Alternative 4 Present Worth

Year	Surface Water Transfer — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Spot Surface Water Transfer — Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
	Capital Cost (1995):		-		Capital Cost (1995):		-	
	O&M Cost (1995):		$175		O&M Cost (1995):		$300	
1997	0		$0	$0	37,435		$12,737,914	$12,737,914
1998	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0
2003	0		$0	$0	0		$0	$0
2004	0		$0	$0	[illegible]		[illegible]	[illegible]
2005	0		$0	$0	0		$0	$0
2006	0		$0	$0	0		$0	$0
2007	2,912		$1,084,987	$578,001	0		$0	$0
2008	6,300		$2,499,905	$1,250,483	0		$0	$0
2009	9,687		$4,093,755	$1,922,767	0		$0	$0
2010	7,075		$3,184,261	$1,404,312	0		$0	$0
2011	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2012	16,950		$8,652,689	$3,364,395	0		$0	$0
2013	20,137		$10,947,772	$3,996,981	0		$0	$0
2014	23,325		$13,505,238	$4,629,765	0		$0	$0
2015	26,512		$16,348,304	$5,262,350	0		$0	$0
2016	29,700		$19,504,565	$5,895,134	0		$0	$0
2017	32,887		$23,001,369	$6,527,720	0		$0	$0
2018	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2019	39,262		$31,145,912	$7,793,090	0		$0	$0
2020	34,483		$29,132,871	$6,844,509	0		$0	$0
2021	35,571		$32,005,449	$7,060,466	0		$0	$0
2022	36,660		$35,129,334	$7,276,620	0		$0	$0
2023	37,748		$38,523,081	$7,492,577	0		$0	$0
2024	38,837		$42,210,680	$7,708,732	0		$0	$0
2025	[illegible]		$46,213,750	[illegible]	26,500		[illegible]	[illegible]
2026	41,014		$50,560,111	$8,140,843	0		$0	$0
2027	42,102		$55,274,933	$8,356,800	0		$0	$0
2028	43,191		$60,390,464	$8,572,955	0		$0	$0
2029	44,279		$65,935,988	$8,788,911	0		$0	$0
2030	45,368		$71,948,866	$9,005,066	0		$0	$0
2031	45,886		$77,500,433	$9,107,883	0		$0	$0
2032	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2033	46,923		$89,889,490	$9,313,717	0		$0	$0
2034	47,442		$96,791,170	$9,416,733	0		$0	$0
2035	47,960		$104,208,114	$9,519,550	0		$0	$0
2036	48,479		$112,182,631	$9,622,566	0		$0	$0
2037	48,997		$120,751,091	$9,725,384	0		$0	$0
2038	49,516		$129,962,105	$9,828,400	0		$0	$0
2039	[illegible]		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2040	50,553		$150,493,358	$10,034,233	0		$0	$0
Subtotals:	1,185,957			$235,399,864	196,518			$66,868,689
	10.6%		Unit Cost ($/AF purchased):	$198	*1.6%*		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	11,216,450		$1,411,503,847
		Unit Cost ($/AF):	$126
Totals (without CVP allocation):	3,757,797		$1,123,675,605
		Unit Cost ($/AF):	$299

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C-100431

Service Area "F" Resource Alternative 5 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 3				CCCSD Zone 1 Project	Historical Demand (AF/yr) [b]	Normal Year		Drought Year		CVP Raw Water Allocation [c]			
		Capital Cost (1995): -								Cutback: 25%		Capital Cost (1995): -			
		O&M Cost (1995): -										O&M Cost (1995): $56			
		Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)		CVP Contract (AF/yr) [c]	Net Deficit (AF/yr)	CVP Contract (AF/yr) [d]	Net Deficit (AF/yr)	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	183,900	2,856		$1,704,000	$1,704,000	125	180,920	195,000	0	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
1998	187,167	3,807		$2,362,000	$2,217,840	249	183,111	195,000	0	137,333	-	183,111		$11,534,577	$10,830,589
1999	190,533	4,758		$3,071,000	$2,707,576	374	185,401	195,000	0	139,051	-	185,401		$12,146,027	$10,708,657
2000	193,900	5,710		$3,832,000	$3,172,318	498	187,692	195,000	0	140,769	-	187,692		$12,787,937	$10,586,482
2001	197,960	7,251		$4,085,000	$3,159,818	623	190,086	195,000	0	142,565	-	190,086		$13,469,088	$10,469,833
2002	202,020	8,791		$4,311,000	$3,146,516	664	192,565	195,000	0	144,424	-	192,565		$14,190,535	$10,357,399
2003	206,080	10,332		$4,570,000	$3,131,977	706	195,042	195,000	42	161,250	-	195,000		$14,944,774	$10,242,164
2004	210,140	11,872		[illegible]	[illegible]	747	[illegible]	[illegible]	[illegible]	161,250	[illegible]	161,250		[illegible]	[illegible]
2005	214,200	13,413		$5,129,000	$3,099,102	789	199,998	195,000	4,998	161,250	-	195,000		$16,164,268	$9,766,955
2006	218,260	14,953		$5,431,000	$3,081,295	830	202,477	195,000	7,477	161,250	-	195,000		$16,810,838	$9,537,683
2007	222,320	16,494		$5,749,000	$3,062,642	830	204,996	195,000	9,996	161,250	-	195,000		$17,483,272	$9,313,794
2008	226,380	18,034		$6,084,000	$3,043,291	830	207,516	195,000	12,516	161,250	-	195,000		$18,182,603	$9,095,160
2009	230,440	19,575		$6,437,000	$3,023,349	830	210,035	195,000	15,035	161,250	-	195,000		$18,909,907	$8,881,659
2010	234,500	21,115		$6,808,000	$3,002,442	830	212,555	195,000	17,555	161,250	-	195,000		$19,666,303	$8,673,169
2011	[illegible]	22,658		[illegible]	[illegible]	830	[illegible]	166,000	[illegible]	139,500	[illegible]	139,500		[illegible]	[illegible]
2012	242,220	24,196		$7,608,000	$2,958,192	830	217,194	166,000	51,194	139,500	-	166,000		$18,107,683	$7,040,747
2013	246,080	25,737		$8,040,000	$2,935,368	830	219,513	166,000	53,513	139,500	-	166,000		$18,831,990	$6,875,472
2014	249,940	27,277		$8,495,000	$2,912,192	830	221,833	166,000	55,833	139,500	-	166,000		$19,585,270	$6,714,076
2015	253,800	28,818		$8,973,000	$2,888,316	830	224,152	166,000	58,152	139,500	-	166,000		$20,368,881	$6,556,468
2016	257,660	30,358		$9,475,000	$2,863,760	830	226,472	166,000	60,472	139,500	-	166,000		$21,183,428	$6,402,561
2017	261,520	31,899		$10,003,000	$2,838,822	830	228,791	166,000	62,791	139,500	-	166,000		$22,030,765	$6,252,266
2018	[illegible]	[illegible]		[illegible]	[illegible]	830	[illegible]	166,000	[illegible]	139,500	[illegible]	139,500		[illegible]	[illegible]
2019	269,240	34,980		$11,143,000	$2,788,115	830	233,430	166,000	67,430	139,500	-	166,000		$23,828,476	$5,962,177
2020	273,100	36,520		$11,756,000	$2,761,968	830	235,750	166,000	69,750	139,500	-	166,000		$24,781,615	$5,822,220
2021	274,580	36,728		$12,202,000	$2,691,785	830	237,022	166,000	71,022	139,500	-	166,000		$25,772,879	$5,685,548
2022	276,060	36,936		$12,664,000	$2,623,196	830	238,294	166,000	72,294	139,500	-	166,000		$26,803,794	$5,552,085
2023	277,540	37,144		$13,143,000	$2,556,258	830	239,566	166,000	73,566	139,500	-	166,000		$27,875,946	$5,421,754
2024	279,020	37,352		$13,641,000	$2,491,190	830	240,838	166,000	74,838	139,500	-	166,000		$28,990,984	$5,294,483
2025	280,500	37,560		$14,157,000	[illegible]	830	242,110	166,000	[illegible]	139,500	102,610	139,500		[illegible]	[illegible]
2026	281,980	37,768		$14,693,000	$2,365,768	830	243,382	166,000	77,382	139,500	-	166,000		$31,356,648	$5,048,833
2027	283,460	37,976		$15,250,000	$2,305,588	830	244,654	166,000	78,654	139,500	-	166,000		$32,610,914	$4,930,316
2028	284,940	38,184		$15,827,000	$2,246,781	830	245,926	166,000	79,926	139,500	-	166,000		$33,915,351	$4,814,581
2029	286,420	38,392		$16,426,000	$2,189,497	830	247,198	166,000	81,198	139,500	-	166,000		$35,271,965	$4,701,562
2030	287,900	38,600		$17,047,000	$2,133,590	830	248,470	166,000	82,470	139,500	-	166,000		$36,682,843	$4,591,197
2031	288,810	38,808		$17,692,000	$2,079,171	830	249,172	166,000	83,172	139,500	-	166,000		$38,150,157	$4,483,422
2032	289,720	39,016		[illegible]	[illegible]	830	249,874	166,000	[illegible]	139,500	110,374	139,500		[illegible]	[illegible]
2033	290,630	39,224		$19,056,000	$1,974,449	830	250,576	166,000	84,576	139,500	-	166,000		$41,263,210	$4,275,404
2034	291,540	39,432		$19,777,000	$1,924,088	830	251,278	166,000	85,278	139,500	-	166,000		$42,913,738	$4,175,042
2035	292,450	39,640		$20,524,000	$1,874,895	830	251,980	166,000	85,980	139,500	-	166,000		$44,630,288	$4,077,036
2036	293,360	39,848		$21,300,000	$1,827,027	830	252,682	166,000	86,682	139,500	-	166,000		$46,415,499	$3,981,331
2037	294,270	40,056		$22,106,000	$1,780,434	830	253,384	166,000	87,384	139,500	-	166,000		$48,272,119	$3,887,873
2038	295,180	40,264		$22,941,000	$1,734,916	830	254,086	166,000	88,086	139,500	-	166,000		$50,203,004	$3,796,608
2039	[illegible]	40,472		[illegible]	[illegible]	830	[illegible]	166,000	[illegible]	139,500	115,288	139,500		[illegible]	[illegible]
2040	297,000	40,680		$24,708,000	$1,647,420	830	255,490	166,000	89,490	139,500	-	166,000		$54,299,589	$3,620,456
Subtotals:	11,216,450	1,228,920			$111,999,540	33,825	9,953,705					7,448,220			$287,241,422
		11.0%		Unit Cost ($/AF avoided):	$91	0.3%	88.7%					66.4%		Unit Cost ($/AF purchased):	$39

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

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Service Area "F" Resource Alternative 5 Present Worth

Year	Net Deficit (AF/yr)	ECCID Quantity (AF/yr)	ECCID Escalated Capital Cost	ECCID Escalated O&M Cost	ECCID Total Present Worth Cost	Surface Water Transfer Quantity (AF/yr)	Surface Water Transfer Escalated Capital Cost	Surface Water Transfer Escalated O&M Cost	Surface Water Transfer Total Present Worth Cost	Spot Surface Water Transfer Quantity (AF/yr)	Spot Surface Water Transfer Escalated Capital Cost	Spot Surface Water Transfer Escalated O&M Cost	Spot Surface Water Transfer Total Present Worth Cost
		Capital Cost (1995): -				Capital Cost (1995): -				Capital Cost (1995): -			
		O&M Cost (1995): $63				O&M Cost (1995): $175				O&M Cost (1995): $300			
1997	245,206	8,000		$504,000	$504,000	0		$0	$0	37,205		$12,659,652	$12,659,652
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	42	42		$2,646	$1,813	0		$0	$0	0		$0	$0
2004	38,271	15,000		$945,000	$608,113	0		$0	$0	27,271		$11,247,490	$7,237,830
2005	4,998	4,998		$314,874	$190,257	0		$0	$0	0		$0	$0
2006	7,477	7,477		$471,051	$267,252	0		$0	$0	0		$0	$0
2007	9,996	9,996		$629,748	$335,483	0		$0	$0	0		$0	$0
2008	12,516	12,516		$788,508	$394,421	0		$0	$0	0		$0	$0
2009	15,035	15,000		$945,000	$443,850	35		$14,791	$6,947	0		$0	$0
2010	17,555	17,555		$1,105,965	$487,749	0		$0	$0	0		$0	$0
2011	75,374	21,000		$1,323,000	$547,855	27,874		$13,360,757	$5,532,893	26,500		$21,776,135	$9,017,089
2012	51,194	21,000		$1,323,000	$514,417	30,194		$15,413,527	$5,993,188	0		$0	$0
2013	53,513	21,000		$1,323,000	$483,021	32,513		$17,676,164	$6,453,485	0		$0	$0
2014	55,833	21,000		$1,323,000	$453,541	34,833		$20,168,401	$6,913,980	0		$0	$0
2015	58,152	21,000		$1,323,000	$425,860	37,152		$22,909,331	$7,374,277	0		$0	$0
2016	60,472	21,000		$1,323,000	$399,869	39,472		$25,922,026	$7,834,773	0		$0	$0
2017	62,791	21,000		$1,323,000	$375,463	41,791		$29,228,881	$8,295,069	0		$0	$0
2018	91,611	21,000		$1,323,000	[illegible]	44,111		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2019	67,430	21,000		$1,323,000	$331,031	46,430		$36,832,171	$9,215,862	0		$0	$0
2020	69,750	21,000		$1,323,000	$310,827	48,750		$41,186,308	$9,676,357	0		$0	$0
2021	71,022	21,000		$1,323,000	$291,856	50,022		$45,007,916	$9,928,836	0		$0	$0
2022	72,294	21,000		$1,323,000	$274,044	51,294		$49,152,321	$10,181,314	0		$0	$0
2023	73,566	21,000		$1,323,000	$257,318	52,566		$53,645,339	$10,433,792	0		$0	$0
2024	74,838	21,000		$1,323,000	$241,613	53,838		$58,514,782	$10,686,271	0		$0	$0
2025	102,610	21,000		$1,323,000	$226,867	55,110		$63,790,601	$10,938,749	26,500		$52,584,211	$9,017,089
2026	77,382	21,000		$1,323,000	$213,020	56,382		$69,505,051	$11,191,228	0		$0	$0
2027	78,654	21,000		$1,323,000	$200,019	57,654		$75,692,865	$11,443,706	0		$0	$0
2028	79,926	21,000		$1,323,000	$187,811	58,926		$82,391,435	$11,696,185	0		$0	$0
2029	81,198	21,000		$1,323,000	$176,349	60,198		$89,641,017	$11,948,663	0		$0	$0
2030	82,470	21,000		$1,323,000	$165,586	61,470		$97,484,941	$12,201,142	0		$0	$0
2031	83,172	21,000		$1,323,000	$155,480	62,172		$105,007,125	$12,340,481	0		$0	$0
2032	110,374	21,000		$1,323,000	$145,990	62,874		[illegible]	[illegible]	26,500		$117,151,156	$9,017,089
2033	84,576	21,000		$1,323,000	$137,080	63,576		$121,791,322	$12,619,161	0		$0	$0
2034	85,278	21,000		$1,323,000	$128,714	64,278		$131,139,978	$12,758,500	0		$0	$0
2035	85,980	21,000		$1,323,000	$120,858	64,980		$141,189,392	$12,897,840	0		$0	$0
2036	86,682	21,000		$1,323,000	$113,482	65,682		$151,991,162	$13,037,179	0		$0	$0
2037	87,384	21,000		$1,323,000	$106,555	66,384		$163,600,636	$13,176,519	0		$0	$0
2038	88,086	21,000		$1,323,000	$100,052	67,086		$176,077,183	$13,315,858	0		$0	$0
2039	115,288	21,000		$1,323,000	$93,946	67,788		$189,454,486	$13,456,398	26,500		$126,984,264	$9,017,089
2040	89,490	21,000		$1,323,000	$88,212	68,490		$203,890,769	$13,594,537	0		$0	$0
Subtotals:	2,505,485	720,584			$10,852,222	1,593,925			$316,377,177	190,976			$84,982,926
	22.3%	6.4%		Unit Cost ($/AF purchased):	$15	14.2%		Unit Cost ($/AF purchased):	$198	1.7%		Unit Cost ($/AF purchased):	$340

Totals (with CVP allocation):	11,216,450		$791,453,287
		Unit Cost ($/AF):	$71
Totals (without CVP allocation):	3,768,230		$504,211,865
		Unit Cost ($/AF):	$134

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Service Area "F" Resource Alternative 6 Present Worth

Year	Gross Demand (AF/yr)	Conservation Program 3 Quantity (AF/yr)	Conservation Program 3 Escalated Capital Cost	Conservation Program 3 Escalated O&M Cost	Conservation Program 3 Total Present Worth Cost	CCCSD Zone 1 Project Quantity (AF/yr)	Historical Demand (AF/yr) [b]	Normal Year CVP Contract (AF/yr) [c]	Normal Year Net Deficit (AF/yr)	Drought Year Cutback: 25% CVP Contract (AF/yr) [d]	Drought Year Net Deficit (AF/yr)	CVP Raw Water Allocation [c] Quantity (AF/yr)	CVP Raw Water Allocation [c] Escalated Capital Cost	CVP Raw Water Allocation [c] Escalated O&M Cost	CVP Raw Water Allocation [c] Total Present Worth Cost
		Capital Cost (1995): -										Capital Cost (1995): -			
		O&M Cost (1995): -										O&M Cost (1995): $56			
1997	183,900	2,555	$1,405,000	$1,204,000	125	180,820	195,000	0	135,615	45,205	55,615		$5,214,716	$5,214,716	
1998	187,167	3,807	$2,362,000	$2,217,840	249	183,111	195,000	0	137,333	-	183,111		$11,534,577	$10,830,589	
1999	190,533	4,758	$3,071,000	$2,707,576	374	185,401	195,000	0	139,051	-	185,401		$12,146,027	$10,708,657	
2000	193,900	5,710	$3,832,000	$3,172,318	498	187,692	195,000	0	140,769	-	187,692		$12,787,937	$10,586,482	
2001	197,960	7,251	$4,085,000	$3,159,818	623	190,086	195,000	0	142,585	-	190,086		$13,469,088	$10,469,833	
2002	202,020	8,791	$4,311,000	$3,148,516	664	192,565	195,000	0	144,424	-	192,565		$14,190,535	$10,357,399	
2003	206,080	10,332	$4,570,000	$3,131,977	706	195,042	195,000	42	161,250	-	195,000		$14,944,774	$10,242,164	
2004	210,140	11,872	$4,829,000	$3,115,438	747	197,520	195,000	2,520	161,250	-	195,000		$15,698,955	$10,126,867	
2005	214,200	13,413	$5,129,000	$3,099,102	789	199,998	195,000	4,998	161,250	-	195,000		$16,164,268	$9,766,955	
2006	218,260	14,953	$5,431,000	$3,081,295	830	202,477	195,000	7,477	161,250	-	195,000		$16,810,838	$9,537,683	
2007	222,320	16,494	$5,749,000	$3,062,642	830	204,996	195,000	9,996	161,250	-	195,000		$17,483,272	$9,313,794	
2008	226,380	18,034	$6,084,000	$3,043,291	830	207,516	195,000	12,516	161,250	-	195,000		$18,182,603	$9,095,160	
2009	230,440	19,575	$6,437,000	$3,023,349	830	210,035	195,000	15,035	161,250	-	195,000		$18,909,907	$8,881,659	
2010	234,500	21,115	$6,808,000	$3,002,442	830	212,555	195,000	17,555	161,250	-	195,000		$19,666,303	$8,673,169	
2011	238,560	22,656	$7,178,000	$2,980,571	830	215,074	166,000	0	139,500	26,574	166,000		$20,451,723	$8,469,003	
2012	242,220	24,196	$7,608,000	$2,958,192	830	217,194	166,000	51,194	139,500	-	166,000		$18,107,683	$7,040,747	
2013	246,080	25,737	$8,040,000	$2,935,366	830	219,513	166,000	53,513	139,500	-	166,000		$18,831,990	$6,875,472	
2014	249,940	27,277	$8,495,000	$2,912,192	830	221,833	166,000	55,833	139,500	-	166,000		$19,585,270	$6,714,076	
2015	253,800	28,818	$8,973,000	$2,888,316	830	224,152	166,000	58,152	139,500	-	166,000		$20,368,681	$6,556,468	
2016	257,660	30,358	$9,475,000	$2,863,760	830	226,472	166,000	60,472	139,500	-	166,000		$21,183,428	$6,402,561	
2017	261,520	31,899	$10,003,000	$2,838,822	830	228,791	166,000	62,791	139,500	-	166,000		$22,030,765	$6,252,266	
2018	265,380	33,439	$10,557,000	$2,813,721	830	231,111	166,000	65,111	139,500	-	166,000		$22,911,995	$6,105,503	
2019	269,240	34,980	$11,143,000	$2,788,115	830	233,430	166,000	67,430	139,500	-	166,000		$23,828,476	$5,962,177	
2020	273,100	36,520	$11,756,000	$2,761,968	830	235,750	166,000	69,750	139,500	-	166,000		$24,781,615	$5,822,220	
2021	274,580	36,726	$12,202,000	$2,691,785	830	237,022	166,000	71,022	139,500	-	166,000		$25,772,879	$5,685,548	
2022	276,060	36,936	$12,664,000	$2,623,196	830	238,294	166,000	72,294	139,500	-	166,000		$26,803,794	$5,552,085	
2023	277,540	37,144	$13,143,000	$2,556,258	830	239,566	166,000	73,566	139,500	-	166,000		$27,875,946	$5,421,754	
2024	279,020	37,352	$13,641,000	$2,491,190	830	240,838	166,000	74,838	139,500	-	166,000		$28,990,984	$5,294,483	
2025	280,500	37,560	$14,157,000	$2,427,921	830	242,110	166,000	76,110	139,500	10,410	166,000		$30,150,623	$5,170,203	
2026	281,980	37,768	$14,693,000	$2,365,768	830	243,382	166,000	77,382	139,500	-	166,000		$31,356,648	$5,048,833	
2027	283,460	37,976	$15,250,000	$2,305,588	830	244,654	166,000	78,654	139,500	-	166,000		$32,610,914	$4,930,316	
2028	284,940	38,184	$15,827,000	$2,246,781	830	245,926	166,000	79,926	139,500	-	166,000		$33,915,351	$4,814,581	
2029	286,420	38,392	$16,428,000	$2,189,497	830	247,198	166,000	81,198	139,500	-	166,000		$35,271,985	$4,701,562	
2030	287,900	38,600	$17,047,000	$2,133,590	830	248,470	166,000	82,470	139,500	-	166,000		$36,682,843	$4,591,197	
2031	288,810	38,808	$17,692,000	$2,079,171	830	249,172	166,000	83,172	139,500	-	166,000		$38,150,157	$4,483,422	
2032	289,720	39,016	$18,360,000	$2,026,062	830	249,874	166,000	83,874	139,500	10,410	166,000		$39,676,163	$4,378,182	
2033	290,630	39,224	$19,056,000	$1,974,449	830	250,576	166,000	84,576	139,500	-	166,000		$41,263,210	$4,275,404	
2034	291,540	39,432	$19,777,000	$1,924,088	830	251,278	166,000	85,278	139,500	-	166,000		$42,913,738	$4,175,042	
2035	292,450	39,640	$20,524,000	$1,874,895	830	251,980	166,000	85,980	139,500	-	166,000		$44,630,288	$4,077,036	
2036	293,360	39,848	$21,300,000	$1,827,027	830	252,682	166,000	86,682	139,500	-	166,000		$46,415,499	$3,981,331	
2037	294,270	40,056	$22,106,000	$1,780,434	830	253,384	166,000	87,384	139,500	-	166,000		$48,272,119	$3,887,873	
2038	295,180	40,264	$22,941,000	$1,734,916	830	254,086	166,000	88,086	139,500	-	166,000		$50,203,004	$3,796,608	
2039	296,090	40,472	$23,808,000	$1,690,647	830	254,788	166,000	88,788	139,500	15,288	166,000		$52,211,215	$3,707,485	
2040	297,000	40,680	$24,708,000	$1,647,420	830	255,490	166,000	89,490	139,500	-	166,000		$54,299,569	$3,620,456	
Subtotals:	11,216,450	1,228,920			$111,999,840	33,825	9,953,705					7,448,220			$287,241,422
		11.0%	Unit Cost ($/AF avoided):		$91	0.3%	88.7%					66.4%	Unit Cost ($/AF purchased):		$39

a - Values shown in bold are from EDAW projections.
b - Historical demand = gross demand - conservation - CCCSD Zone 1 project
c - CVP supply based on normal year contract amount of 195,000 AF/yr through 2010 and 166,000 AF/yr thereafter.
Planning scenario based on one drought year every seven. Drought year rows are shaded.

C—100434

C-100435

Service Area "F" Resource Alternative 6 Present Worth

Year	Net Deficit (AF/yr)	Central County Urban Irrigation — Quantity (AF/yr)	Central County Urban Irrigation — Escalated Capital Cost	Central County Urban Irrigation — Escalated O&M Cost	Central County Urban Irrigation — Total Present Worth Cost	Antioch Urban Irrigation — Quantity (AF/yr)	Antioch Urban Irrigation — Escalated Capital Cost	Antioch Urban Irrigation — Escalated O&M Cost	Antioch Urban Irrigation — Total Present Worth Cost	Central County Industrial (Cooling Towers) — Quantity (AF/yr)	Central County Industrial (Cooling Towers) — Escalated Capital Cost	Central County Industrial (Cooling Towers) — Escalated O&M Cost	Central County Industrial (Cooling Towers) — Total Present Worth Cost
		Capital Cost (1995): $24,660,000; O&M Cost (1995): $337				Capital Cost (1995): $72,940,000; O&M Cost (1995): $320				Capital Cost (1995): $48,460,000; O&M Cost (1995): $935			
1997	45,205	0		$0	$0	0		$0	$0	0		$0	$0
1998	0	0		$0	$0	0		$0	$0	0		$0	$0
1999	0	0		$0	$0	0		$0	$0	0		$0	$0
2000	0	0		$0	$0	0		$0	$0	0		$0	$0
2001	0	0		$0	$0	0		$0	$0	0		$0	$0
2002	0	0		$0	$0	0		$0	$0	0		$0	$0
2003	42	0		$0	$0	0		$0	$0	0		$0	$0
2004	38,271	0		$0	$0	0		$0	$0	0		$0	$0
2005	4,998	0		$0	$0	0		$0	$0	0		$0	$0
2006	7,477	0		$0	$0	0		$0	$0	0		$0	$0
2007	9,996	0		$0	$0	0		$0	$0	0		$0	$0
2008	12,516	0		$0	$0	0		$0	$0	0		$0	$0
2009	15,035	0		$0	$0	0		$0	$0	0		$0	$0
2010	17,555	0		$0	$0	0		$0	$0	0		$0	$0
2011	76,374	0		$0	$0	0		$0	$0	0		$0	$0
2012	51,194	0		$0	$0	0		$0	$0	0		$0	$0
2013	53,513	0		$0	$0	0		$0	$0	0		$0	$0
2014	55,833	0		$0	$0	0		$0	$0	0		$0	$0
2015	58,152	0		$0	$0	0		$0	$0	0		$0	$0
2016	60,472	0		$0	$0	0		$0	$0	0		$0	$0
2017	62,791	0	$29,221,099	$0	$8,292,861	0	$86,430,938	$0	$24,528,844	0	$57,423,132	$0	$16,296,514
2018	91,611	0	$30,389,943	$0	[illegible]	0	[illegible]	$0	[illegible]	0	[illegible]	$0	$16,913,967
2019	67,430	0		$0	$0	0		$0	$0	0		$0	$0
2020	69,750	1,687		$1,515,579	$356,072	6,280		$5,357,265	$1,258,642	13,300		$33,151,006	$7,788,535
2021	71,022	1,687		$1,576,202	$347,713	6,280		$5,571,555	$1,229,096	13,300		$34,477,048	$7,605,705
2022	72,294	1,687		$1,639,250	$339,551	6,280		$5,794,417	$1,200,244	13,300		$35,856,130	$7,427,168
2023	73,566	1,687		$1,704,820	$331,580	6,280		$6,026,194	$1,172,069	13,300		$37,290,375	$7,252,821
2024	74,838	1,687		$1,773,013	$323,797	6,280		$6,267,242	$1,144,556	13,300		$38,781,990	$7,082,567
2025	102,610	1,687		$1,843,933	$316,196	6,280		[illegible]	[illegible]	13,300		$40,333,270	$6,916,309
2026	77,382	1,687		$1,917,690	$308,773	6,280		$6,778,649	$1,091,452	13,300		$41,946,601	$6,753,955
2027	78,654	1,687		$1,994,398	$301,525	6,280		$7,049,795	$1,065,831	13,300		$43,624,465	$6,595,411
2028	79,926	1,687		$2,074,174	$294,447	6,280		$7,331,787	$1,040,811	13,300		$45,369,443	$6,440,589
2029	81,198	1,687		$2,157,141	$287,535	6,280		$7,625,058	$1,016,379	13,300		$47,184,221	$6,289,402
2030	82,470	1,687		$2,243,427	$280,786	6,280		$7,930,060	$992,520	13,300		$49,071,590	$6,141,763
2031	83,172	1,687		$2,333,164	$274,194	6,280		$8,247,263	$969,222	13,300		$51,034,453	$5,997,590
2032	110,374	1,687		$2,426,490	$267,758	6,280		$8,577,153	$945,470	13,300		[illegible]	$5,856,802
2033	84,576	1,687		$2,523,550	$261,472	6,280		$8,920,240	$924,253	13,300		$55,198,865	$5,719,318
2034	85,278	1,687		$2,624,492	$255,335	6,280		$9,277,049	$902,556	13,300		$57,406,819	$5,585,062
2035	85,980	1,687		$2,729,471	$249,341	6,280		$9,648,131	$881,370	13,300		$59,703,092	$5,453,957
2036	86,682	1,687		$2,838,650	$243,488	6,280		$10,034,056	$860,680	13,300		$62,091,216	$5,325,930
2037	87,384	1,687		$2,952,196	$237,772	6,280		$10,435,419	$840,476	13,300		$64,574,864	$5,200,908
2038	88,086	1,687		$3,070,284	$232,191	6,280		$10,852,835	$820,747	13,300		$67,157,859	$5,078,821
2039	115,258	1,687		$3,193,096	$226,740	6,280		[illegible]	[illegible]	13,300		[illegible]	$4,959,600
2040	89,490	1,687		$3,320,819	$221,418	6,280		$11,736,427	$782,667	13,300		$72,637,940	$4,843,177
Subtotals:	2,505,485	35,427			$22,348,738	131,880			$69,541,103	279,300			$162,525,873
	22.3%	0.3%		Unit Cost ($/AF):	$631	1.2%		Unit Cost ($/AF):	$527	2.5%		Unit Cost ($/AF):	$582

C—100435

C-100436

Service Area "F" Resource Alternative 6 Present Worth

Year	ECCID				Surface Water Transfer				Spot Surface Water Transfer			
	Capital Cost (1995): -				Capital Cost (1995): -				Capital Cost (1995): -			
	O&M Cost (1995): $63				O&M Cost (1995): $175				O&M Cost (1995): $300			
	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost	Quantity (AF/yr)	Escalated Capital Cost	Escalated O&M Cost	Total Present Worth Cost
1997	8,000		$504,000	$504,000	[illegible]		[illegible]	[illegible]	37,205		[illegible]	[illegible]
1998	0		$0	$0	0		$0	$0	0		$0	$0
1999	0		$0	$0	0		$0	$0	0		$0	$0
2000	0		$0	$0	0		$0	$0	0		$0	$0
2001	0		$0	$0	0		$0	$0	0		$0	$0
2002	0		$0	$0	0		$0	$0	0		$0	$0
2003	42		$2,646	$1,813	0		$0	$0	0		$0	$0
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2005	4,998		$314,874	$190,257	0		$0	$0	0		$0	$0
2006	7,477		$471,051	$267,252	0		$0	$0	0		$0	$0
2007	9,996		$629,748	$335,483	0		$0	$0	0		$0	$0
2008	12,516		$788,508	$394,421	0		$0	$0	0		$0	$0
2009	15,000		$945,000	$443,850	35		$14,791	$6,947	0		$0	$0
2010	17,555		$1,106,965	$487,749	0		$0	$0	0		$0	$0
[illegible]	21,000		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2012	21,000		$1,323,000	$514,417	30,194		$15,413,527	$5,993,188	0		$0	$0
2013	21,000		$1,323,000	$483,021	32,513		$17,676,164	$6,453,485	0		$0	$0
2014	21,000		$1,323,000	$453,541	34,833		$20,168,401	$6,913,980	0		$0	$0
2015	21,000		$1,323,000	$425,860	37,152		$22,909,331	$7,374,277	0		$0	$0
2016	21,000		$1,323,000	$399,869	39,472		$25,922,026	$7,834,773	0		$0	$0
2017	21,000		$1,323,000	$375,463	41,791		$29,228,881	$8,295,069	0		$0	$0
[illegible]	21,000		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2019	21,000		$1,323,000	$331,031	46,430		$36,832,171	$9,215,862	0		$0	$0
2020	21,000		$1,323,000	$310,827	27,483		$23,218,940	$5,455,083	0		$0	$0
2021	21,000		$1,323,000	$291,856	28,755		$25,872,668	$5,707,562	0		$0	$0
2022	21,000		$1,323,000	$274,044	30,027		$28,773,282	$5,960,040	0		$0	$0
2023	21,000		$1,323,000	$257,318	31,299		$31,941,663	$6,212,519	0		$0	$0
2024	21,000		$1,323,000	$241,613	32,571		$35,400,367	$6,464,997	0		$0	$0
2025	21,000		$1,323,000	[illegible]	33,843		[illegible]	[illegible]	26,500		[illegible]	[illegible]
2026	21,000		$1,323,000	$213,020	35,115		$43,288,104	$6,969,954	0		$0	$0
2027	21,000		$1,323,000	$200,019	36,387		$47,771,818	$7,222,433	0		$0	$0
2028	21,000		$1,323,000	$187,811	37,659		$52,655,518	$7,474,911	0		$0	$0
2029	21,000		$1,323,000	$176,349	38,931		$57,972,265	$7,727,390	0		$0	$0
2030	21,000		$1,323,000	$165,588	40,203		$63,757,721	$7,979,868	0		$0	$0
2031	21,000		$1,323,000	$155,480	40,905		$69,087,635	$8,119,208	0		$0	$0
2032	21,000		$1,323,000	[illegible]	41,607		[illegible]	[illegible]	26,500		[illegible]	$9,017,069
2033	21,000		$1,323,000	$137,080	42,309		$81,050,539	$8,397,887	0		$0	$0
2034	21,000		$1,323,000	$128,714	43,011		$87,751,044	$8,537,227	0		$0	$0
2035	21,000		$1,323,000	$120,858	43,713		$94,980,177	$8,676,566	0		$0	$0
2036	21,000		$1,323,000	$113,482	44,415		$102,778,348	$8,815,906	0		$0	$0
2037	21,000		$1,323,000	$106,555	45,117		$111,188,991	$8,955,245	0		$0	$0
2038	21,000		$1,323,000	$100,052	45,819		$120,258,779	$9,094,585	0		$0	$0
[illegible]	21,000		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
2040	21,000		$1,323,000	$88,212	47,223		$140,580,140	$9,373,264	0		$0	$0
Subtotals:	720,584			$10,852,222	1,147,318			$227,730,433	190,976			$84,992,926
	6.4%	Unit Cost ($/AF purchased):		$15	*10.2%*	Unit Cost ($/AF purchased):		$198	*1.7%*	Unit Cost ($/AF purchased):		$340

Totals (with CVP allocation):	11,216,450		$957,222,257
		Unit Cost ($/AF):	$85
Totals (without CVP allocation):	3,768,230		$669,980,834
		Unit Cost ($/AF):	$178

C-100436